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U. S. DEPARTMENT OF AGRICULTURE.

OFFICE OF EXPERIMENT STATIONS.

W. O. ATWATER, DIRECTOR.

MISCELLANEOUS BULLETIN No. 2.

PROCEEDINGS

OF THE

THIRD ANNUAL CONVENTION

OF THE ASSOCIATION OF

American Agricultural Colleges and Experiment Stations

HELD AT

WASHINGTON, D. C.,

NOVEMBER 12, 13, 14, AND 15, 1889.

EDITED BY

A. W. HARRIS, for the Office of Experiment Stations,

AND

H. E. ALVORD, for the Executive Committee of the Association.

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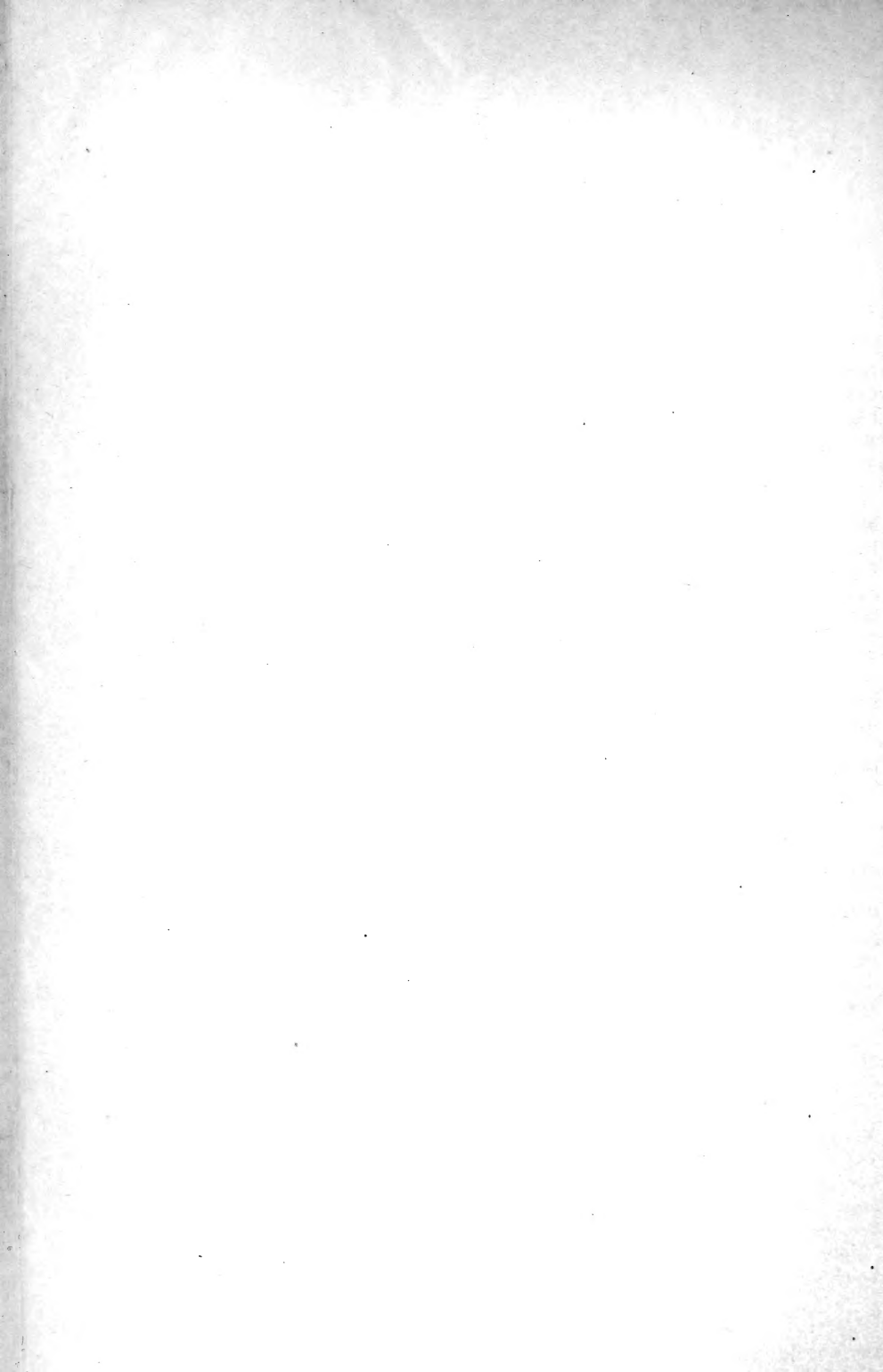


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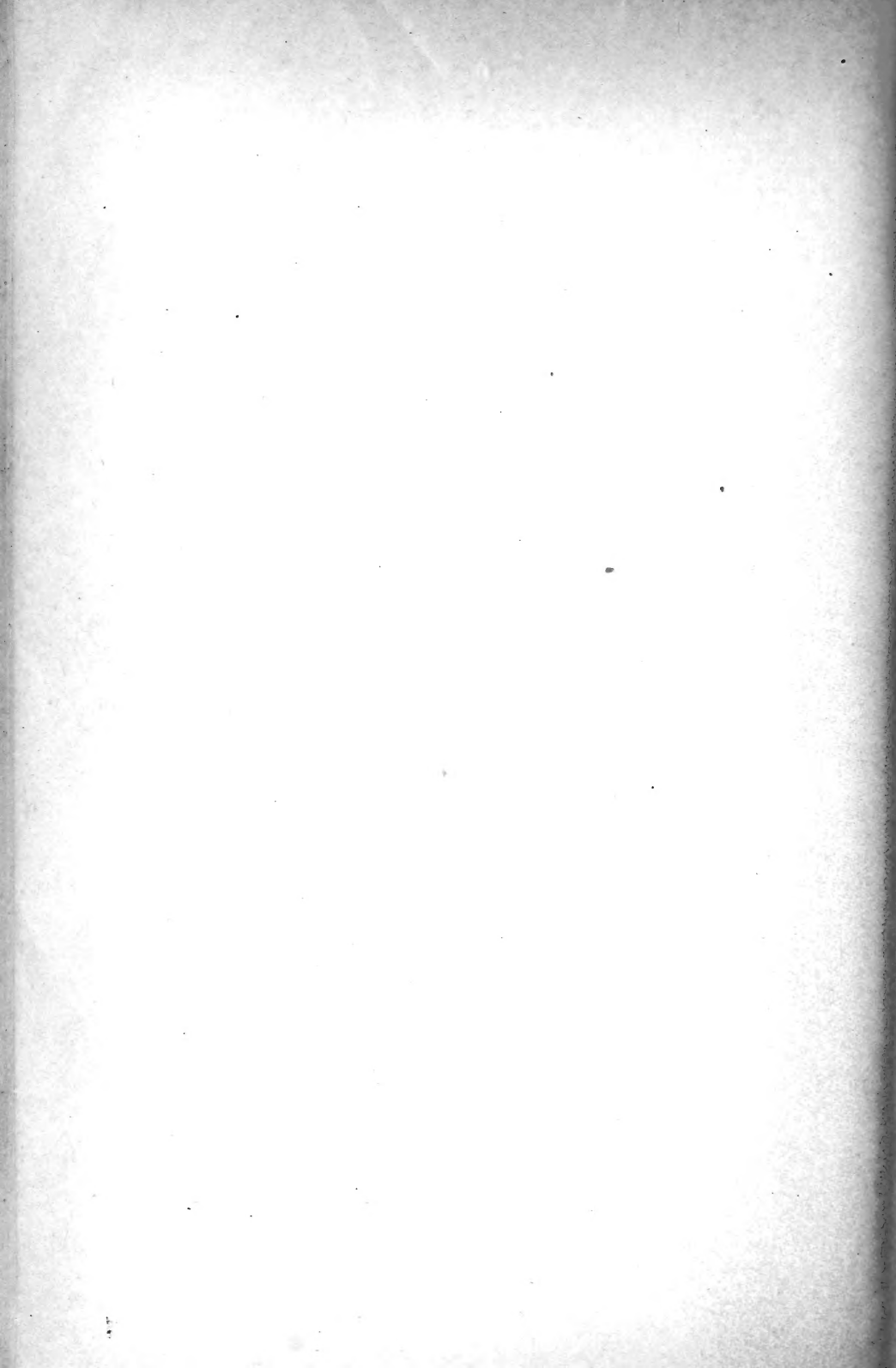
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LETTER OF TRANSMITTAL.

DEPARTMENT OF AGRICULTURE,
OFFICE OF EXPERIMENT STATIONS,

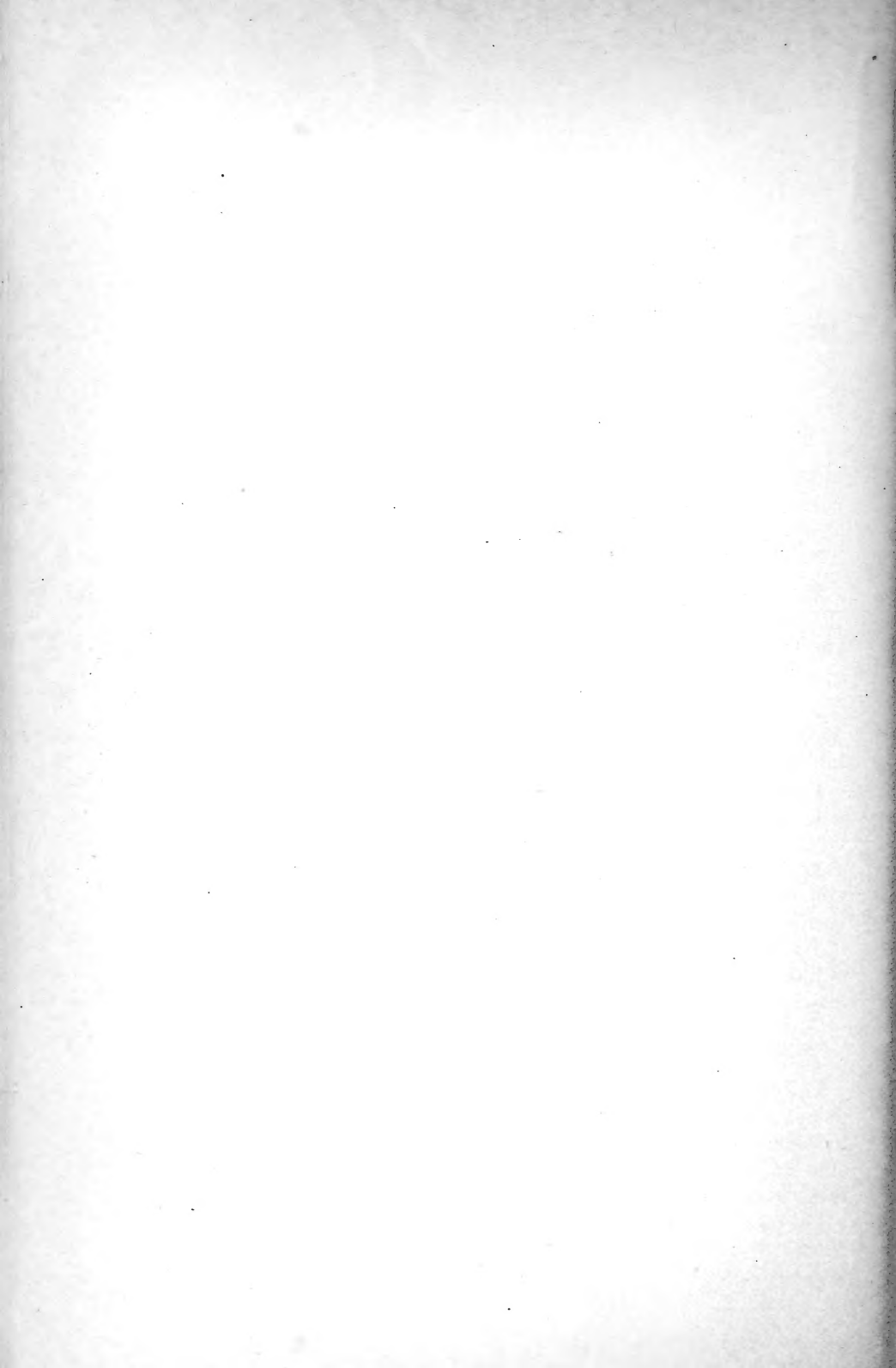
May 20, 1890.

SIR: I have the honor to transmit herewith for publication Miscellaneous Bulletin No. 2 of this Office, containing the proceedings of the third annual convention of the Association of American Agricultural Colleges and Experiment Stations, held at Washington, D. C., November 12, 13, 14, and 15, 1889, which have been edited by the assistant director of this Office in conjunction with the chairman of the executive committee of the Association.

Very respectfully,

W. O. ATWATER,
Director.

Hon. J. M. RUSK,
Secretary of Agriculture.



CONSTITUTION

OF THE

ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS.

NAME.

This Association shall be called The Association of American Agricultural Colleges and Experiment Stations.

OBJECT.

The object of this Association shall be the consideration and discussion of all questions pertaining to the successful progress and administration of the colleges and stations included in the Association.

MEMBERSHIP.

At any regularly called meeting of the Association each college established under the act of Congress approved July 2, 1862, and each experiment station established under State or Congressional authority, and the Department of Agriculture, shall be entitled to one delegate; but no delegate shall cast more than one vote. Other institutions engaged in experimental work in the interest of agriculture may be admitted to representation in this Association by a majority vote at any regular meeting of the Association.

Any person engaged in agriculture, who shall attend the conventions of this Association, not as a delegate, may, by vote of the convention, be admitted to all the privileges of the floor, except the right to vote.

OFFICERS.

The officers of this Association shall be a president, five vice-presidents, and a secretary, who shall act as treasurer. They shall be chosen by ballot, and shall perform the duties which usually devolve upon such officers. They shall hold office from the close of the meeting at which they were elected and until their successors shall be elected.

The president, secretary, and five persons, to be chosen by the Association, shall constitute an executive committee, which shall elect its own chairman.

The executive committee shall determine the time and place of the next meeting of the Association; shall issue its call for said meeting, stating the general purpose thereof, not less than thirty days before the date at which it shall be held; shall provide a well-prepared order of business and programme of exercises for such meeting, and shall make seasonable issue of said programme.

It shall be the duty of each institution included in this Association to present, at each regularly called meeting, a brief report of the work and progress of said institution, and such report shall be called for in the regular order of business.

The executive committee shall be charged with the general arrangement and conduct of the meeting called by it, at which meeting, before its adjournment, a new executive committee shall be chosen.

PERMANENT COMMITTEES.

The Association shall be organized into permanent committees upon the several classes of special subjects, the consideration of which shall become desirable. Each institution represented in the Association shall be entitled to representation upon each committee by one delegate. Each committee shall nominate to the convention a chairman, to hold office until the close of the next convention. Each chairman shall present at the first general session of the convention a report of progress in his subject during the preceding year, together with any other facts connected therewith which he may deem of interest. Such reports shall not exceed fifteen minutes in length. The annual address of the president of the Association shall be given upon the evening of the same day. Provision shall be made in the programme for conferences of each of the committees, either simultaneously or consecutively as the executive committee shall determine. At least two committees shall each year present in general sessions of the convention a portion of the subjects coming before them. The committees to thus report shall be designated by the executive committee, and general notice of the selection shall be given at least three months in advance. There shall be permanent committees on agriculture, on botany, on chemistry, on entomology, and on horticulture; and the executive committee, upon request of any five institutions represented in the Association, shall provide for the organization of a new committee at any convention.

AMENDMENTS.

This constitution may be amended at any regularly called meeting by a vote of two-thirds of the delegates present.

OFFICERS OF THE ASSOCIATION.

ELECTED AT KNOXVILLE, TENN., JANUARY, 1889.
(Term of office expired with Washington Convention.)

President.

GEORGE W. ATHERTON, of Pennsylvania.

Vice-Presidents.

S. W. JOHNSON, of Connecticut.

L. L. MCINNIS, of Texas.

C. L. INGERSOLL, of Colorado.

E. H. MURFEE, of Arkansas.

W. B. PRESTON, of Virginia.

Secretary and Treasurer.

CHARLES E. THORNE, of Ohio.

Executive Committee.

The PRESIDENT, the SECRETARY and

HENRY E. ALVORD, of Maryland.

I. P. ROBERTS, of New York.

W. A. HENRY, of Wisconsin.

J. M. MCBRYDE, of South Carolina.

H. H. GOODELL, of Massachusetts.

ELECTED AT WASHINGTON, D. C., NOVEMBER, 1889.

President.

JAMES H. SMART, of Indiana.

Vice-Presidents.

M. E. GATES, of New Jersey.

F. A. GULLEY, of Texas.

GEO. T. FAIRCHILD, of Kansas.

R. J. REDDING, of Georgia.

E. W. HILGARD, of California.

Secretary and Treasurer.

H. P. ARMSBY, of Pennsylvania.

Executive Committee.

The PRESIDENT, the SECRETARY and

HENRY E. ALVORD, of Maryland.

WM. H. SCOTT, of Ohio.

STEPHEN D. LEE, of Mississippi.

M. A. SCOVELL, of Kentucky.

E. H. JENKINS, of Connecticut.

Chairmen of Permanent Committees.

Agriculture, F. A. GULLEY, of Texas.

Chemistry, C. W. DABNEY, jr., of Tennessee.

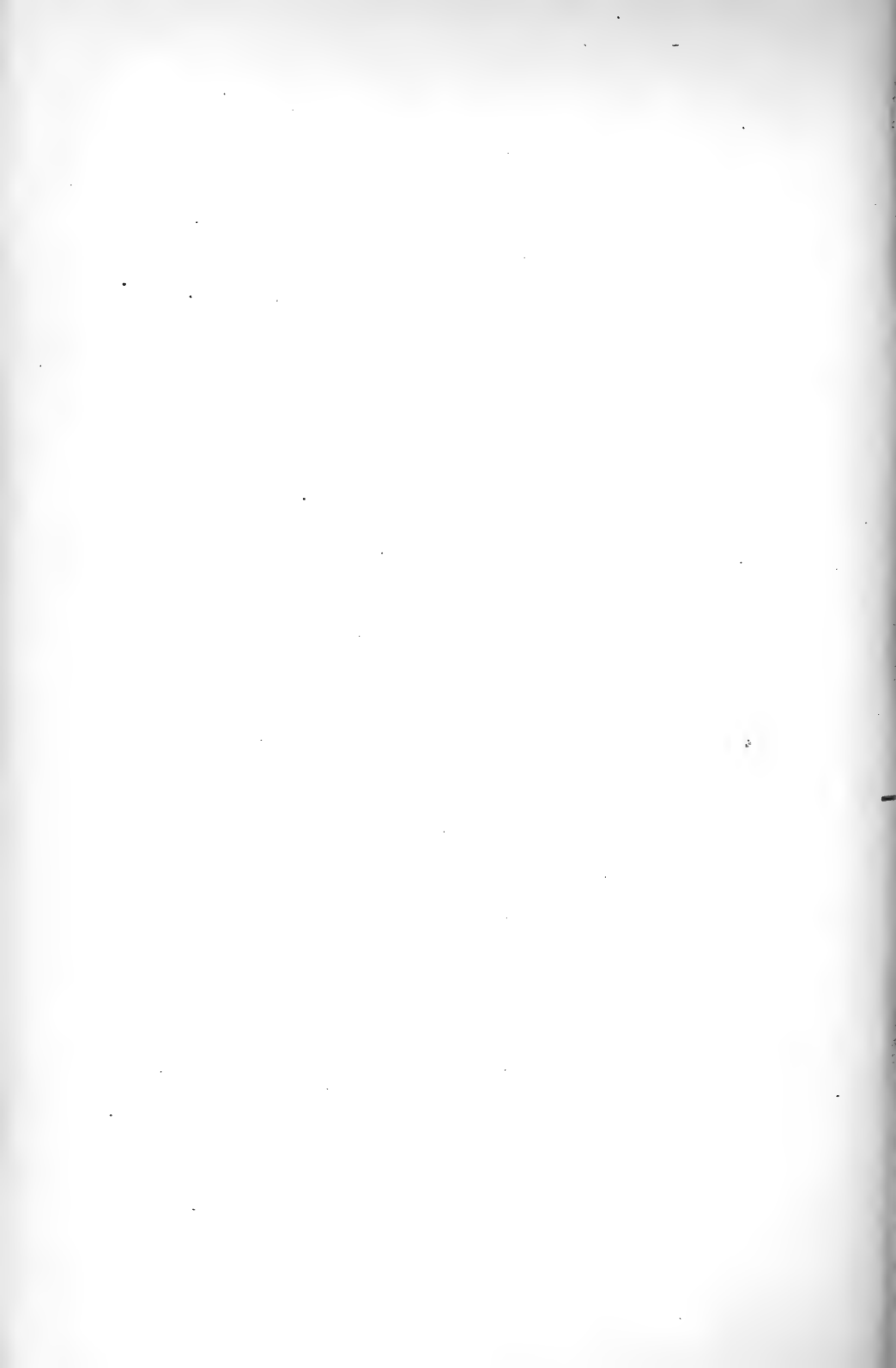
Botany, S. M. TRACY, of Mississippi.

Entomology, S. A. FORBES, of Illinois.

Horticulture, W. J. GREEN, of Ohio.

Chairman of Standing Committee on College Work.

GEORGE W. ATHERTON, of Pennsylvania.



PROGRAMME.

TUESDAY, NOVEMBER 12, 1889.

Noon.—Convention called to order at lecture room of the U. S. National Museum. Presentation of credentials and action thereon.

1.30 p. m.—Report of the executive committee. Action on programme and rules of order. Report of treasurer.

2.30 p. m.—Discussion, "The primary obligations of the colleges and stations under the Hatch act." To be opened by Messrs. Lee, of Mississippi; Fernald, of Maine; Patterson, of Kentucky; and Atwater, of Washington.

4.00 p. m.—Conference of college presidents.

4.30 p. m.—Conference of experiment station directors.

5.00 p. m.—Adjournment for dinner.

7.00 p. m.—Discussion, "Uniformity in the methods and records of chemical laboratories." Opened by Messrs. Jenkins, of Connecticut; Collier, of New York; Stubbs, of Louisiana; and Stockbridge, of Indiana.

9.00 p. m.—Discussion, "The annual report of institutions organized under the act of July 2, 1862." To be opened by Messrs. Gates, of New Jersey; Broun, of Alabama; Raub, of Delaware; and Bessey, of Nebraska.

NOTE.—Paragraph 4, of section 5, Chapter CXXX, second session Thirty-seventh Congress of the United States, reads as follows: "An annual report shall be made regarding the progress of each college, recording any improvements and experiments made, with their cost and results, and such other matters, *including State industrial and economical statistics*, as may be supposed useful."

WEDNESDAY, NOVEMBER 13.

9.00 a. m.—Meet at Department of Agriculture and call upon the Secretary.

9.30 a. m. (at National Museum).—Discussion, "What amendments to the Hatch act, if any, are needed?" To be opened by Messrs. Dabney, of Tennessee; McLouth, of Dakota; Neale, of Delaware; and Porter, of Missouri.

11.00 a. m.—Discussion, proposed amendments to the constitution of this association. (See pages 97 and 98, 103 to 108 of proceedings of the Knoxville convention.) To be opened by Messrs. Armsby, of Pennsylvania; Chamberlain, of Iowa; Whitney, of South Carolina; and Morrow, of Illinois.

12.30 p. m.—Adjourn for lunch.

2.00 p. m.—Re-assemble and divide into conferences. (Programmes to be announced.) Introduction of resolutions, or other business, for reference.

2.30 p. m.—Meetings of conferences for special discussions.

5.00 p. m.—Adjourn for dinner.

7.00 p. m.—General meeting at the Museum. Annual address by the president of the Association. Informal addresses by the vice-presidents.

9.00 p. m.—Reception at the Ebbitt House tendered to all attending the convention and their friends who may be in Washington.

THURSDAY, NOVEMBER 14.

9.00 *a. m.*—Discussion, "The horticultural work of experiment stations." To be opened by Messrs. Alwood, of Virginia; Bailey, of New York; Tracy, of Mississippi; and Taft, of Michigan.

10.30 *a. m.*—Discussion, "What should be the relation between colleges and experiment stations, and the agricultural exhibitions, institutes, and other public meetings held in their respective States." To be opened by Messrs. Willits, of Washington; Menke, of Arkansas; Myers, of West Virginia; and Whitcher, of New Hampshire.

Noon.—Proceed to the White House and call upon the President.

2.00 *p. m.*—General business meeting. Choice of officers and committees. Report and consideration of resolutions. Miscellaneous business.

5.00 *p. m.*—Adjourn for dinner.

7.00 *p. m.*—Meet at the Museum and divide into conferences. (Programmes to be announced.)

7.30 *p. m.*—Meetings of conferences for special discussions.

FRIDAY, NOVEMBER 15.

9.00 *a. m.*—General conference of directors and workers at experiment stations. "Subjects needing special consideration." To be presented by Messrs. Goessman, of Massachusetts; Plumb, of Tennessee; Frear, of Pennsylvania; Babcock, of Wisconsin; Newman, of Alabama; and Green, of Ohio.

Noon.—Final adjournment.

PROCEEDINGS.

FIRST DAY.

MORNING SESSION, TUESDAY, NOVEMBER 12, 1889.

The convention was called to order at 12.19 p. m., in the lecture room of the U. S. National Museum, by President Atherton.

Rev. John Shackelford, of Kentucky, offered prayer.

The PRESIDENT. Gentlemen of the convention, the chair will not occupy much time with words of congratulation, but he would fail to recognize a feeling which he is confident is common to all the delegates, were he not to express his gratification caused by the fact that the meeting represents so well such a large variety of interests. The chair can only wish that our meetings may be as harmonious as they have been heretofore, and that all interests may be wisely considered and conciliated.

The programme prepared by the executive committee requires the presentation of credentials.

Mr. ALVORD. The executive committee has a list of the accredited delegates which, if directed, it can complete in a short time.

The PRESIDENT. Shall the executive committee be instructed to complete the list of delegates?

Mr. TRACY. I move that the matter be referred to the executive committee with power.

The motion was agreed to.

The PRESIDENT. The secretary suggests that each one write his name and official position on a slip and hand it to the executive committee.

Next in order is the report of the executive committee.

Mr. GATES. I move that the chairman of the executive committee now present his report.

The motion was agreed to.

Mr. Alvord then read the following report :

Report of the executive committee for the year ending November 12, 1889.

Immediately after the adjournment of the convention of the Association at Knoxville, in January, 1889, the executive committee was called together and organized by the choice of Henry E. Alvord as chairman and Charles E. Thorne as secretary.

This committee having performed its duty under the constitution up to the opening

of a new convention of the Association, and having made preparations for this meeting, now respectfully presents the following report:

The Knoxville convention decided that, in order to enable the Association to discharge what were regarded as debts of honor by the reimbursement of certain individuals for expenses actually incurred in labors which proved equally beneficial to all eligible to Association membership, directed that every college and every experiment station so eligible be called upon to contribute \$25 to the treasury of the Association during the year 1889. It was hoped that this would produce a fund of about \$2,000, which would be ample to meet all existing obligations, defray the necessary expenses of the present year, and perhaps leave a balance sufficient for a year more. This call was sent to eighty institutions, in thirty-nine different States and Territories. The treasurer has received about two-fifths of the expected revenues of the Association. As will be shown in detail by the treasurer's report, the receipts for the present year were \$1,109.75, which, together with the balance from last year, makes a total of \$1,285.27. Of this there has been expended up to the present date for old debts or obligations \$780.24; and for the current expenses of the Association for ten months since last report \$316, or the total sum of \$1,096.24; leaving an unexpended balance of \$189.03 in the hands of the treasurer. Thus, notwithstanding an unexpectedly small collection for the year, the current expenses have been so light that the Association is now free from all old obligations and with a small cash balance on hand.

The committee in all its work, as the agent of this body, including the distribution of circulars of information, has treated alike all eligible to representation here, under the constitution of the Association. As the organization is for the good of all, it would seem that the burden of supporting the Association should be borne as equally as possible. In view of the fact that some institutions have not seen fit to participate in its work, it is thought that this convention should consider what action, if any, should be taken in regard to future conditions of membership.

The committee recommends that before the adjournment of this convention, provision be made for a reasonable sum for the use of the Association during the next year, by fixing upon an amount which every institution eligible to membership shall be called upon to pay for the year 1890, and before the first day of July in that year.

According to action taken by the executive committee at its meeting last January, a subcommittee visited the President-elect of the United States at Indianapolis, during the month of February, and obtained a very satisfactory interview. The resolutions adopted at the Knoxville convention were presented and explained, together with the purposes and some of the hopes of this Association. General Harrison responded approvingly, and not only at that time but immediately after his inauguration evinced a purpose of recognizing the Association and its expressed views. This was shown when, early in March, representatives of the committee present at Washington first met the new Secretary of Agriculture, and for some days co-operated harmoniously and effectively with him in important matters connected with the newly enlarged Department. While it seems unnecessary to make a detailed report, the committee believes it proper to state that it is really owing to the existence of this Association and its active influence that the scientific divisions of the Department hold their present satisfactory status, and that a selection was made of an Assistant Secretary of that Department so fully in harmony with this Association and with the work of investigation and instruction which it represents. Within this year, as well as during last year, the action of this Association, through its duly commissioned representatives, recognized as such by the General Government, requiring but a few days of time and moderate expenditure, has fully justified the existence of this body, and well repaid its total cost to date.

During the year, the committee has transacted some business at the Executive Departments of the United States Government, useful to all members of the Association, and has distributed several circulars of information and mailing lists in a form convenient to many.

The committee believes that in many ways, not yet developed in detail, the simple machinery of this Association, aided by the Office of Experiment Stations in the Department of Agriculture, might be made of very great practical and economical value to all the colleges and experiment stations in this country. This is also deemed a suitable subject for consideration at this convention.

In accordance with a resolution adopted at Knoxville the executive committee, in the call for this convention, proposed in general terms a form for the annual reports to the Association, required by its constitution, from all its members. No special time has been assigned in the programme, for the presentation of these reports. The committee believes that, being in writing, these reports, unless called for, had better be filed without reading, and either published as a part of the record of the convention, or turned over to the United States Department of Agriculture.

The committee wishes to briefly explain that failure to secure satisfactory concessions from railroads for the delegates to the convention of the Association is due to the small number attending, and more particularly to the wide territory through which the delegates are scattered. This necessitates dealing with a great number of different railway corporations, only a few of which, marked by the convergence of the lines upon the place of meeting, are sufficiently patronized by delegates to make special rates and increased attendance of material value to them. It might as well be regarded as settled that advantageous terms can be made with only a few lines near the meeting place for the year. The only method, therefore, of making the cost of attendance at all equitable is to change the place of meeting, so as to give comparatively short and inexpensive journeys next year to those who this year have the greater burdens in this particular. The time required to attend the convention also becomes a factor in the equitable selection of the place of meeting from year to year.

The committee formally submits to the convention the programme prepared for this meeting, and asks its confirmation, subject to such modifications as may prove expedient, and recommends the adoption of the rules of order which governed the proceedings at Knoxville.

Respectfully submitted.

For the executive committee.

HENRY E. ALVORD,
Chairman.

RULES OF ORDER.

(1) The executive committee shall be charged with the order of business, subject to special action of the convention, and this committee may report at any time.

(2) All business or topics proposed for discussion and all resolutions submitted for consideration of the convention shall be read and then referred, without debate, to the executive committee, to be assigned positions on the programme.

(3) Speakers invited to open discussions shall be entitled to twenty minutes each.

(4) In general discussions, the ten-minute rule shall be enforced.

(5) No speaker shall be recognized a second time on any one subject while any delegate who has not spoken thereon desires to do so.

(6) The hours of meeting and adjournment adopted with the general programme shall be closely observed, unless changed by a two-thirds vote of delegates present.

(7) The presiding officer shall enforce the parliamentary rules usual in such assemblies and not inconsistent with the foregoing.

The PRESIDENT. This report will be received and filed in the regular order of business. The next order will be the report of the secretary and treasurer, Mr. Thorne, of Ohio.

Mr. Thorne, the secretary and treasurer, then read the following report:

REPORT OF TREASURER.

At the Knoxville convention of this Association I reported a balance in the treasury of \$115.52. Immediately after that convention I received \$30 from each of two institutions in payment of dues for 1888.

In obedience to a resolution adopted by the Knoxville convention, a call was issued soon after its adjournment for contributions to meet the expenses of the Association for 1889, and to pay other claims against it. In response to this call I received \$1,109.75, making a total of \$1,255.27, received since the last meeting of the Association.

Of this sum, \$1,096.24 have been expended under direction of the executive committee, leaving a balance now on hand of \$159.03.

The itemized statement of receipts and expenditures is held by the executive committee, subject to inspection by any member of the Association who may wish to see it.

CHAS. E. THORNE,
Secretary.

The PRESIDENT. What action will the convention take on this report of the treasurer?

Mr. MURFEE. I move that the report be referred to an auditing committee.

The PRESIDENT. The Chair understands that as a motion to appoint an auditing committee. Of how many?

Mr. MURFEE. Three.

The motion was agreed to and the president appointed Messrs. Murfee, Fairchild, and Myers.

Mr. HICKS. I move that the programme recommended by the executive committee be adopted.

The PRESIDENT. The Chair suggests that the executive committee should have authority to change the order of topics on the programme as may seem necessary. Will the gentleman accept the suggestion?

Mr. HICKS. I am willing to have my motion so understood.

The motion was agreed to.

The PRESIDENT. Before the convention adjourns for lunch the Chair desires the secretary to read a communication.

The secretary read the following letter:

DEPARTMENT OF AGRICULTURE, OFFICE OF THE SECRETARY,
Washington, D. C., November 11, 1889.

DEAR SIR: Will you be so good as to say to the members of your association who are in attendance at the convention which meets this morning that Mrs. Rusk and myself will be happy to see them and their ladies at our residence, No. 1330 Massachusetts avenue, on Wednesday evening, November 13, 1889, from 8 to 11 o'clock.

Truly yours,

J. M. RUSK.

Prof. GEO. W. ATHERTON,

President Association of American Agricultural Colleges and Experiment Stations.

The PRESIDENT. What action will the convention take?

Mr. SMART. I move that the president of the Association be instructed to accept the invitation on behalf of the members of the Association.

The motion was agreed to.

The PRESIDENT. What is the further pleasure of the convention?

Mr. ALVORD. Unfortunately not one of the college presidents invited to open the discussion on the subject of "The Primary Obligations of the Colleges and Stations under the Hatch act" is present. The executive committee suggests that this discussion be omitted or deferred, and that this convention divide into two conferences, one of college presidents and one of experiment station directors. I am also instructed by the committee to explain that by "college presidents" and "experiment station directors" the programme means the delegates from the colleges and the delegates from the stations.

The PRESIDENT. Is it the pleasure of the convention to make this change in the programme?

The suggestion was adopted.

The PRESIDENT. We are now ready to adjourn. The programme calls for a meeting at 1.30, but it seems hardly possible to reassemble at that time.

Mr. ALVORD. I move that 2 o'clock be the hour for reassembling.

The PRESIDENT. The motion now is that we adjourn for lunch to reassemble at 2 o'clock.

The motion was agreed to.

AFTERNOON SESSION, TUESDAY, NOVEMBER 12, 1889.

The convention was called to order at 2.12 p. m.

The PRESIDENT. The report of the committee on credentials is in order. The Chair suggests that any one noticing errors make them known.

Mr. ALVORD. The committee reports that thirty-three States and Territories are represented and that, including one from Canada, there are seventy-two persons in attendance upon the convention.

Mr. Alvord then read the list of persons, which, as subsequently perfected, is as follows:

Alabama:

WILLIAM LEROY BROWN, President of the Agricultural and Mechanical College.

Arkansas:

E. H. MURFEE, President of the Arkansas Industrial University and member of the Board of Control of the Station.

A. E. MENKE, Director of the Arkansas Agricultural Experiment Station.

Connecticut:

E. H. JENKINS, Vice-Director of the Connecticut Agricultural Experiment Station.

ROLAND THAXTER, Mycologist of the Connecticut Agricultural Experiment Station.

C. S. PHELPS, Vice-Director of the Storrs School Agricultural Experiment Station.

CHAS. D. WOODS, Chemist of the Storrs School Agricultural Experiment Station.

Delaware :

- A. N. RAUB, President of the Delaware College.
- A. T. NEALE, Director of the Delaware College Agricultural Experiment Station.
- M. H. BECKWITH, Horticulturist and Entomologist of the Delaware College and of the Delaware College Agricultural Experiment Station.

District of Columbia :

- EDWIN WILLITS, Assistant Secretary of Agriculture.
- W. O. ATWATER, Director of the Office of Experiment Stations.
- A. W. HARRIS, Assistant Director of the Office of Experiment Stations.
- FRED V. COVILLE, Assistant Botanist of the U. S. Department of Agriculture.
- A. C. TRUE, Editor of the Office of Experiment Stations.
- E. H. FARRINGTON, of the Office of Experiment Stations.

Georgia :

- R. J. REDDING, Director of the Georgia Experiment Station.
- GUSTAVE SPETH, Horticulturist of the Georgia Experiment Station.
- JOHN P. CAMPBELL, Professor of Biology of the Georgia State College of Agriculture and Mechanic Arts.

Illinois :

- G. E. MORROW, Agriculturist of the Agricultural Experiment Station of the University of Illinois.
- S. A. FORBES, Professor of Entomology of the University of Illinois.

Indiana :

- JAMES H. SMART, President of Purdue University.
- H. E. STOCKBRIDGE, Director of the Agricultural Experiment Station of Indiana.
- J. C. ARTHUR, Botanist of the Agricultural Experiment Station of Indiana.

Iowa :

- R. P. SPEER, Director of the Iowa Agricultural Experiment Station.
- C. P. GILLETTE, Entomologist of the Iowa Agricultural Experiment Station.

Kansas :

- GEORGE T. FAIRCHILD, President of the Kansas State Agricultural College, representing also the Kansas Agricultural Experiment Station.

Kentucky :

- JOHN SHACKLEFORD, Vice-President of the Agricultural and Mechanical College of Kentucky.
- M. A. SCOVELL, Director of the Kentucky Agricultural Experiment Station.
- H. GARMAN, Botanist and Entomologist of the Kentucky Agricultural Experiment Station.

Maine :

- WALTER BALENTINE, Professor of Agriculture in the Maine State College of Agriculture and the Mechanic Arts.
- W. H. JORDAN, Director of the Maine State College Agricultural Experiment Station

Maryland :

- HENRY E. ALVORD, President of Maryland Agricultural College and Director of the Maryland Agricultural Experiment Station.
- W. H. BISHOP, Horticulturist of the Maryland Agricultural Experiment Station.
- A. I. HAYWARD, Agriculturist of the Maryland Agricultural Experiment Station.
- H. J. PATTERSON, Chemist of the Maryland Agricultural Experiment Station.

Massachusetts :

- HENRY E. GOODELL, President of the Massachusetts Agricultural College, and Director of the Hatch Experiment Station of the Massachusetts Agricultural College.
- CHAS. A. GOESSMANN, Director of the Massachusetts State Agricultural Experiment Station.
- E. LEWIS STURTEVANT, visitor.

Michigan :

- O. CLUTE, President of the Michigan Agricultural College, and Director of the Agricultural Experiment Station of the Michigan Agricultural College.
 EUGENE DAVENPORT, Professor of Agriculture in the Michigan Agricultural College and Agriculturist of the Agricultural Experiment Station.

Mississippi :

- S. M. TRACY, Director of the Mississippi Agricultural Experiment Station.

Missouri :

- E. D. PORTER, Dean of the Missouri Agricultural College and Director of the Missouri Agricultural College Experiment Station.

Nebraska :

- L. E. HICKS, Director of the Agricultural Experiment Station of Nebraska.
 LAWRENCE BRUNER, Entomologist of the Agricultural Experiment Station of Nebraska.

New Hampshire :

- C. H. PETTEE, Dean of the New Hampshire College of Agriculture and the Mechanic Arts.
 G. H. WHITCHER, Director of the New Hampshire Agricultural Experiment Station.

New Jersey :

- M. E. GATES, President of Rutgers College.
 JAMES NEILSON, Member of the Governing Board of the New Jersey State Agricultural Experiment Station.
 EDWARD B. VOORHEES, Chemist of the New Jersey State Agricultural Experiment Station.
 BYRON D. HALSTED, Botanist of the New Jersey Agricultural College Experiment Station.

New Mexico :

- HIRAM HADLEY, President of the Agricultural College of New Mexico and Director of the Agricultural Experiment Station of New Mexico.

New York :

- I. P. ROBERTS, Director and Agriculturist of the Cornell University Agricultural Experiment Station.
 LEROY BROWN, Jr., visitor.

North Carolina :

- ALEXANDER Q. HOLLADAY, President of the North Carolina College of Agriculture and Mechanic Arts.
 GERALD MCCARTHY, Botanist of the North Carolina Agricultural Experiment Station.

Ohio :

- WILLIAM H. SCOTT, President of the Ohio State University.
 CHARLES E. THORNE, Director of the Ohio Agricultural Experiment Station.
 WILLIAM J. GREEN, Vice-Director and Horticulturist of the Ohio Agricultural Experiment Station.
 J. FREMONT HICKMAN, Agriculturist of the Ohio Agricultural Experiment Station.

Pennsylvania :

- G. W. ATHERTON, President of the Pennsylvania State College.
 H. P. ARMSBY, Director of the Pennsylvania State College Agricultural Experiment Station.

Rhode Island :

- CHARLES O. FLAGG, Director of the Rhode Island State Agricultural Experiment Station.
 L. F. KINNEY, Horticulturist of the Rhode Island State Agricultural Experiment Station.

South Carolina :

MILTON WHITNEY, Vice-Director of the South Carolina Agricultural Experiment Station.

W. B. BURNEY, Professor of Chemistry in the University of South Carolina.

Tennessee :

CHAS. W. DABNEY, Jr., President of the University of Tennessee and Director of the Tennessee Agricultural Experiment Station.

CHAS. S. PLUMB, Assistant Director of the Tennessee Agricultural Experiment Station.

F. LAMSON SCRIBNER, Professor of Botany in the University of Tennessee and Botanist and Horticulturist of the Tennessee Agricultural Experiment Station.

Texas :

LOUIS L. MCINNIS, Chairman of the Faculty of the Agricultural and Mechanical College of Texas.

F. A. GULLEY, Director of the Texas Agricultural Experiment Station.

Vermont :

W. W. COOKE, Professor of Agriculture in the State Agricultural College, and Director of the Vermont State Agricultural Experiment Station.

Virginia :

L. L. LOMAX, President of the Virginia Agricultural and Mechanical College.

WM. B. ALWOOD, Vice-Director of the Virginia Agricultural Experiment Station.

D. O. NOURSE, Agriculturist of the Virginia Agricultural Experiment Station.

West Virginia :

E. M. TURNER, President of the West Virginia University.

JOHN A. MYERS, Director of the West Virginia Experiment Station.

THOMAS J. FARNSWORTH, Member of the Board of Regents of the West Virginia University and of the West Virginia Experiment Station.

W. H. BROWN, Member of Board of Regents of the West Virginia University and of the West Virginia Experiment Station.

Wisconsin :

W. A. HENRY, Director of the Agricultural Experiment Station of the University of Wisconsin.

Canada :

WM. SAUNDERS, Director of Experimental Farms.

The PRESIDENT. The list will be accepted, subject to additions as required.

Mr. ALVORD. The executive committee offers for immediate action the following :

Resolved, That the Secretary of Agriculture and the heads of all scientific and educational bureaus of the Government be invited to attend this convention, and that they be tendered the privilege of the floor.

The resolution was adopted without discussion.

The PRESIDENT. According to the order adopted this morning the convention will now resolve itself into two conferences. The conference of college presidents will include the delegates representing colleges; and that of experiment station directors those representing stations. It is understood that these conferences will take no final action, even upon matters referring to their special interests, but will report their wishes to the convention as a whole. Does the Association wish to take any action upon this point? If not, the chair will declare this understanding to be the rule.

(For report of conference of college presidents, see below; for report of experiment station directors, see pages 23 and 103.)

The convention stands adjourned, to meet at 7 o'clock this evening. At 2.26 o'clock p. m. the convention accordingly adjourned.

EVENING SESSION, TUESDAY, NOVEMBER 12, 1889.

The Association was called to order at 7:30 p. m.

The PRESIDENT. The first business will be the reception of reports from the conferences of the afternoon. Are they prepared to report.

Mr. GOODELL. At the conference of college presidents I was instructed to present the following resolution to the convention and to request its adoption :

Resolved, That a committee be appointed to confer with the Secretary of War respecting the amount and method of military instruction that can be profitably given at the agricultural colleges, and to report the result to this Association.

Mr. BROWN. I move the adoption of the resolution.

The resolution was adopted.

Mr. GOODELL. I move that, in accordance with this resolution, a committee of five be appointed, of which the president of the Association and the chairman of the executive committee shall be members.

The motion was agreed to.

The PRESIDENT. The Chair will announce the committee later. (See page 33.)

Is the other conference prepared to report ?

Mr. ATWATER. The experiment station conference directed that the minutes, including resolutions, should be presented to the Association. We have two wishes, that the Association consider our resolutions and that it print our minutes for future reference. The minutes can not yet be presented, but the resolutions are ready.

The PRESIDENT. As the Chair understands that the minutes are not ready, the question is on the adoption of the resolutions. The minutes can be presented later. The Chair suggests that the resolutions be read now for information, and that, if they call for immediate action by the Association, they be considered for adoption or rejection. Otherwise they will go to the executive committee. The secretary will please read the resolutions.

Mr. THORNE. The meeting was organized by the appointment of Professor Atwater as chairman and myself as secretary.

The first subject before us was a communication presented by Director Armsby, of the Pennsylvania Station, from the State Board of Agriculture of Pennsylvania. That communication is as follows :

At the autumn meeting of the Pennsylvania State Board of Agriculture, held at New Castle, Pa., October 23 and 24, 1889, Mr. McDowell, member from Washington County, and chairman of the committee on wool and textile fibres, offered the following, which was unanimously adopted :

Whereas the consumption of flax, hemp, jute, and kindred fibres, in the various

forms in which they are imported and sold in the markets of the United States, amounts to \$683,418,980.70; and

Whereas flax is at present successfully grown in thirty-nine States and Territories, thus showing that the soil and climate of the United States are well adapted to the growth of fibrous plants; and

Whereas there is at present an annual loss of \$25,000,000 worth of flax fiber now grown for the seed alone; and

Whereas the vocation of farming is at present in a depressed condition :

Resolved, That in order to encourage the growth and manufacture of fibrous plants, and with a view to the consequent diversification of farm industry, and with a view to the initiation of experiments on the culture of such plants and the manufacture of the fiber, the director of the Pennsylvania State College Experiment Station be requested to present this question for the consideration of the Association of American Agricultural Colleges and Experiment Stations, and to report to the board at its next annual meeting the results of such consideration.

Resolved, further, That the board urge upon the institutes held under its auspices the importance of this question, and recommend that it be made the subject of discussion, and that the local member of the board in charge of the institute report to the director of the Pennsylvania State College Experiment Station any information elicited in such discussion.

After consideration and discussion, and upon motion by Professor Morrow, it was ordered that a committee of three be appointed by the chairman of the section to consider and report to this Association in regard to the means or methods of experimentation with hemp, flax, and other fibrous plants.

The next resolution read as follows :

Resolved, That the experiment station conference of this association hereby expresses its emphatic disapproval of station publications containing offensive personalities or abusive reference to the educational or other work of persons or institutions.

The following resolution was introduced by Professor Roberts :

Resolved, That the minutes of this meeting be reported to the general Association with a request that they be made part of the record of that Association.

The PRESIDENT. The Chair would ask whether that committee of three was appointed by the conference ?

Mr. THORNE. The committee was appointed by the conference to report to the Association.

The PRESIDENT. The Chair would suggest that what has been read would naturally come before us with the minutes of the conference. The Chair thinks the appointment of the committee within the province of the conference. The only resolution on which we may wish to take action now is the one in regard to publications. Will the secretary be kind enough to read that again ?

The secretary read the resolution.

The PRESIDENT. The Chair suggests that this as the utterance of the conference should go to the committee on resolutions. Then, when acted upon, it will become the voice of the Association, as the Chair supposes the conference intended. If there is no objection, it will be so referred.

Is there any other miscellaneous business?

Mr. PLUMB. I desire to offer the following resolution:

Resolved, That a question box be placed upon the secretary's table in which may be placed questions for discussion by this Association, and that the executive committee provide suitable opportunity for the discussion of such questions.

The resolution was agreed to and a question box was accordingly prepared and placed upon the secretary's table.

The PRESIDENT. Is there any other miscellaneous business to be transacted before we proceed with the regular order? The Chair wishes to remind the Association of the meeting to-morrow morning at 9 o'clock promptly at the Department of Agriculture. The Secretary of Agriculture has intimated that he will be there promptly. The Chair supposes the meeting will take place in the office of the Assistant Secretary.

By agreement of the persons to take part in the discussion of the subjects on the programme for this evening, the order of the first and second subjects has been reversed. If the convention does not object, we will listen to the discussion of the subject, "The annual reports of institutions organized under the act of July 2, 1862." The first speaker in place of President Gates, who has asked to be excused, is Director Hicks.

Mr. HICKS. Before proceeding to what I have to say, I desire to read a few sentences written by my colleague, Dr. Bessey, who is announced to take part in the discussion of this question but is not present. He says:

It has long been my opinion that the institutions organized under the act of July 2, 1862, should make the reports contemplated, and I have repeatedly urged (both in Iowa and in Nebraska) compliance with the law. I feel confident that such reports would have brought the work of the colleges more into harmony, just as their reports and bulletins are bringing the stations into work which is approximately uniform.

The reports of the stations evidently supersede, to a large extent, those contemplated by the law of 1862, and yet I think it would be well to publish one annual report in every case. The results of experiments might well be left out of these reports as they now find publication in the station bulletins and reports, but the latter do not contain anything upon the "progress of the college." I think we ought to have these.

As to the "State industrial and economical statistics," I am of the opinion that they might be included in the station publications, inasmuch as they are limited to such as may be supposed useful.

I do not believe usually in apologizing, but I must state now the fact that until this afternoon I had no expectation of speaking upon this question. I have thought somewhat upon it, but since I was requested to speak upon it and to speak first I have had no time to put together in logical form whatever thought may have been in my own mind, unless I except the time which I spent at dinner, and that is not a very good time for clear thinking. Moreover, a party of gentlemen dining at the same table were so entertaining in their conversation, which I could not help overhearing, that my attention was much distracted.

When the president and several others came into the dining-room together one of the gentlemen asked, "Who are those fellows?" Another said, "Those are the grangers." [Laughter]. Another replied, "They are mighty fine looking grangers." Then the first said, "I don't think they are the grangers, either; they are those fellows that tell the grangers how to do it."

I suppose I am the man guilty of stirring up this question about the annual reports of agricultural colleges, or at least of causing its insertion in the programme. When I was made dean of the Industrial College of Nebraska and saw the item relating to the annual report, being desirous of complying with the law in every particular I inquired whether the annual report had been made by the Industrial College of Nebraska. I found that it had never been made. I then examined the file of publications received by the Industrial College of Nebraska in order to ascertain whether other colleges in the country were complying with the provision of the law. The law requires, I believe, that those reports shall be sent by each college to all the other colleges and to the Department of the Interior at Washington. I found no reports whatever on file, and so I began to suppose that other colleges were neglecting their duty in reference to these reports just as ours was. I then wrote to the Interior Department to ascertain whether the copies required by law to be sent there had been sent. They were not able to tell me anything. I then wrote to the chairman of the executive committee of this body, and asked some questions. Thus, I suppose, this topic got into the programme. The executive committee seems to think this matter ought to be inquired into and discussed.

I know that some colleges have complied with the law, but it is my conviction, gained from experience in seeking information in regard to the matter, that they are rather few. I have not yet seen one report that fully complies with the conditions of the law of 1862. Doubtless some of you, and, possibly, many of you, have. One beneficial result of this discussion will be, I hope, to draw out the facts in regard to the way in which this law has been complied with.

Is it possible or practicable to comply with the law? Some things are inserted in the acts of Congress without full understanding of the scope of their requirements, and the result is that it is found impracticable, inexpedient, or unnecessary to carry out the law in every particular. As I read the law, three things must be included in the reports:

First, they must include an account of the progress of the college. It requires only a little attention and effort to make this report.

Second, the law requires an account of experiments made, of their costs, and their results. Dr. Bessey has said that this part of the report is practically covered by the bulletins of the station. The cost of experiments is not reported by the stations, except indirectly. You find that a station has a bulletin on entomology; then you find in the treasurer's report that so much money was devoted to the subject of

entomology, and thus you get at the cost of the entomological work. But this is only an indirect process, and not a very safe one. Whether it would be desirable to attempt to set down minutely the cost of experimentation in all lines I am not prepared to say, but at any rate the cost of experiments is not now included in the reports of stations or of the colleges, so far as I have examined them.

Third, these reports must include the industrial and economical statistics of the State, and here is the greatest difficulty. Dr. Bessey says: "These might be included in the station publications, inasmuch as they are limited to such as may be supposed useful." I read the law in a different way. The language is:

And such other matters, including State industrial and economical statistics, as may be supposed useful.

"Such other matters as may be supposed useful," necessarily includes the State industrial and economic statistics.

This third requirement is the hard one to comply with. I think that, notwithstanding the difficulties involved, it can be complied with. And I think, furthermore, that compliance with it is advisable and ought to be undertaken for two reasons:

In the first place, because we ought to keep just as near as we can to the letter of the law.

In the second place, because of the good result which would flow from it.

Having stated my convictions in this way, it would be inexcusable in me not to suggest some sort of plan for carrying them out. And now I most need to apologize for crudeness and incompleteness. But incomplete as my plan may be, I will outline it for the sake of having something definite before us to discuss.

I would have a statistician added to the staff of each station, who should organize a corps of observers and reporters throughout the State, furnishing them with blanks and instructions on which to collate, tabulate, and digest their reports. The reports should include not only final statistics of crops, live stock, and manufactures, but also monthly crop reports, abstracts of which should be forwarded to the U. S. Department of Agriculture to form the basis of its bulletins for the whole country.

The Department of Agriculture is publishing crop bulletins. The Secretary alludes to them in his report to Congress, and states as the reason why these reports are not always quite what they ought to be, that the service is not so minutely, thoroughly, and extensively organized as is desirable.

I propose that we institute in the experiment stations of the States a work, which by co-operation with the Department of Agriculture will bring about a complete system of statistical returns.

My last proposition is perhaps the most critical of all. How is this to be done? How is the expense to be borne? By enlarging the ap-

propriations under the Hatch act by an amount sufficient to pay the wages of a statistician for each station and to pay expenses for stationery, postage, etc.; I suppose that \$5,000 in each State judiciously expended would produce very rich results in this direction.

The PRESIDENT. The next speaker is President Broun, of Alabama.

Mr. BROUN. I feel very much indebted to the gentleman who opened the discussion for giving us something to think and talk about. Ever since I saw my name on the programme I have been at a loss to know what to say. Perhaps we can not do better than to ascertain how far the colleges have failed to comply strictly with the law.

In Alabama it is the duty of the college to report to the governor, and through him to the legislature, which has biennial sessions. The college report, though published biennially, may be regarded as an annual report, for distinct reports are made for each year, as ordered by the legislature. The reports contain a report of the progress of the college, the financial report of the secretary, a statement of improvements made, a list of experiments carried on, etc.

The plan proposed for collecting State industrial and economic statistics would involve in our State the duplication of the work of State officers. We have a State geologist who makes an annual report; and a commissioner of agriculture who is required by law to collect statistics in regard to crops and other matters, and to issue monthly reports showing the agricultural condition of the State; and assessors and an auditor who publish regularly reports containing information in regard to the general increase of values.

It has always been a source of extreme gratification to us to receive the reports of other colleges, often large volumes, showing what has been done, covering a large ground and valuable for reference.

In one line of statistics the college has done considerable work. Our meteorological reports have given great satisfaction in the State. The officer in charge of the work has under his control, not only the home station, but forty others, and has been publishing monthly reports for the last ten years. He has been able to do this through his connection with the United States Signal Office.

I fear the college I represent has been remiss in sending its reports to other colleges, as required by law. Sometimes it has complied with the law, as often indeed as it could get reports to send. The reports being made to the governor become the property of the legislature, and the legislature publishes as many of them as it pleases, in other words, as few as it pleases, and the college gets what are left after the members of the legislature have provided themselves with what they want. Sometimes there have been less than a hundred copies left.

The PRESIDENT. The convention will now hear Dr. Raub.

Mr. RAUB. I take great comfort in the statement made by the first gentleman who spoke, that these reports have not been generally made,

for Delaware has not made them, except to the governor. When I received the programme from my friend, Major Alvord, I feared he might be making fun of me. My first impulse was to stay at home, and I have been nervous about this meeting ever since, because I supposed that, through the fault of some one, not myself, Delaware had been remiss in a matter to which all the other colleges had given proper attention.

We have tried to make a statement of the progress of the college in our catalogue but the State is poor, and we have been obliged to economize as much as possible. We have also said something in regard to the progress of the college in the biennial reports to the governor, which the president of the State Agricultural College is required to make. So far as statistics are concerned we have done absolutely nothing. We can make no report on statistics; we have no means of gathering them. I was pleased to hear Mr. Hicks suggest the desirability of an additional appropriation from the United States Government to enable the stations to employ statisticians with necessary assistants.

MR. GATES. If I may be allowed a word—that my asking to be excused be not misunderstood—I will state that my reason for asking the executive committee to excuse me was two-fold: First, I have what I think is a natural and also a cultivated dislike for speaking unless I have something to say; and second, when some four or five days ago, I learned that I was expected to open this discussion, the topic did not suggest to me anything in particular, so I wrote to the executive committee for light and later to the Office of Experiment Stations. The suggestions I got were so closely in accordance with our practice at the New Jersey State College that I thought there was nothing I need say.

But I have here the twenty-fourth annual report of Rutgers Scientific School, the State College of New Jersey in the interest of agriculture and the mechanic arts. Each year since the publication of a report was begun, we have addressed a copy of a similar report to each of our sister institutions. I regret that the college in Nebraska has been omitted. I do not know what I can do better than to give you our idea of what such a report should be, as suggested by the table of contents of our twenty-fourth annual report:

I. List of members of the State Board of Visitors of the college, appointed by the governor.

II. Report of this Board which contains: (1) Catalogue of students on free scholarships; (2) Donations of other States to their agricultural colleges, with some general suggestions.

III. The Trustees' Report, which includes: (1) The faculty; (2) Courses of study and degrees; (3) Post-graduate studies; (4) Terms of admission; (5) List of students; (6) Statements regarding the various departments, subdivided into: (a) Mathematics; (b) Graphics; (c) Astronomy; (d) Physics; (e) Electricity; (f) Chemistry—inorganic, or-

ganic, applied and laboratory practice; (*g*) English language and literature; (*h*) Military instruction; (*i*) Physiology, zoology, botany, geology, and biology; (*j*) The museum; (*k*) Theses of the graduating class in the State College; (*l*) A report on physical training—the gymnasium; (*m*) The libraries; (*n*) The Agricultural Department and State Fund; (*o*) The New Jersey State Agricultural College Experiment Station; the director of that station since its organization was Dr. Cook, who was also professor of agriculture in the college. This is followed by—

IV. A thesis by a student.

V. Courses of study, a full statement covering twenty pages, naming the studies of the courses in civil engineering and mechanics, in chemistry and agriculture, in electricity, and in a special course in agriculture, and giving entrance examination papers.

VI. Farm report for the year 1887-'88, including: (1) Map of the farm, showing topography and drainage; (2) Crops; (3) Map of the farm, showing crops; (4) The weather and the seasons.

There is a Department of Meteorology connected with the college.

VII. Appendix, in which for convenience of reference we have printed for several years the laws relating to the establishment of the Agricultural College, including the act of 1862 and subsequent legislation, and of course the Hatch act. We print also a catalogue of former and present students, with their occupations, as a practical demonstration of the value to the State of the training the college gives and the way in which it promotes the interests of agriculture and the mechanic arts.

The clause of the law in regard to statistics we interpret not as does the gentleman from Nebraska, but as giving the colleges the authority to collect industrial and economical statistics if they think best. New Jersey has a bureau of labor and statistics, and we therefore interpret our duty as calling only for such occasional information as we may have. In this report, for instance, we have elaborated with great care some statements in regard to the population of New Jersey engaged in gainful occupations, those engaged in professional and personal services, and the proportion of time and money which each of these occupations might fairly expect in a division of the fund to be used for general purposes and in promoting the mechanic arts and the interests of agriculture.

This is in general our idea of what a report should be. I imagine more colleges make it than might be inferred from some remarks that have been made here.

Since the matter has been mentioned in discussion, I will say that it does not seem to me wise to ask for any increase in the appropriations under the Hatch act. Rather let us endeavor to secure better and greater results by very careful subdivision of work. It is very foolish for us to go on duplicating experiments that Germany and France have been at work on for thirty years.

Mr. FAIRCHILD. I rise to suggest that the Agricultural College of Nebraska, like others, may have suffered from the depredations of

those who have been connected with it. I am sure reports have been sent to it by colleges with which I have been connected in the last twenty-five years.

We ought to comply with the law. It has never occurred to me that we should not. I have been troubled that our legislature makes provision for the publication of the reports of the Agricultural College once in two years only. We have attempted to obey both State and United States laws by making reports annually, though the legislature has printed them once in two years only.

As to the contents of the report, I second the remarks made by the last speaker. It is certainly impracticable for us to publish all the statistics that might be implied under the terms of the law. Moreover, statistics are cared for by our State itself, and have been for many years. The statistics of agriculture are collected by a board of agriculture and published by the State in three quarterly and three bi-monthly reports. The statistics of other industries are gathered by a labor bureau.

I am most heartily of Professor Gates's opinion, that we should not ask for additional appropriations until we have learned how to use better what we already possess.

Mr. HICKS. May I ask a question?

Mr. FAIRCHILD. Certainly.

Mr. HICKS. You remarked that it was impossible to gather all industrial and economical statistics; do you gather anything to which that designation would apply?

Mr. FAIRCHILD. All are provided for by the bureau of labor and the board of agriculture.

Mr. HICKS. Then you do not give any in your reports?

Mr. FAIRCHILD. We do not.

Mr. HICKS. That is the point I wanted to call out.

Mr. CLUTE. The Michigan State Board of Agriculture, which has had control of the Michigan Agricultural College since 1862, publishes an annual report, which includes a statement of the condition and progress of the college, the reports of the heads of the different departments, and an account of the work of the Board, and in addition, a report of the farmers' institutes held in the different parts of the State, mainly in the winter season, for the purpose of diffusing knowledge and arousing interest in the work of the college and the board.

It has been suggested that the colleges should publish economic statistics in their reports. Our board of agriculture publishes a monthly crop bulletin. It is scarcely worth while to republish that in the annual report of the board.

A State census taken once in ten years and the national census give us full statistics for Michigan once in five years. The college can not add much of value. There are also other agencies, such as the boards of charities and of reforms, that publish statistical and economic reports.

It seems to me, therefore, that Michigan has entirely fulfilled the spirit of the law. It publishes every year the most important and significant facts concerning all the interests of the State. These facts are not included in the annual report of the College of Agriculture, but they are published by the State of Michigan, which is the authority responsible for the property given by the National Government for the support of schools of agriculture and the mechanic arts.

I think that until we have learned how best to conduct the stations upon the generous basis on which they are at present organized, and have proved by our fruits the value of our work, it would be unwise for us to ask for larger appropriations.

Mr. SCOTT. What has been said for New Jersey, Kansas, and Michigan is true of Ohio. The heads of the departments in the university make annual reports to the president; the president transmits these with his own annual report to the board of trustees; the board transmits all these, with a special report of its own and the report of the treasurer of the institution to the governor. These reports are published by the legislature annually. A copy is sent to each of the agricultural colleges founded upon the grant of 1862 and to the Secretary of the Interior.

The experiment station in our State, an institution independent of the college, publishes bulletins and an annual report. A State board of agriculture collects crop and other agricultural statistics, and publishes crop reports and an annual report. A bureau of labor statistics, a mine inspector, a railroad commissioner, and a board of State charities, collect statistics, and the secretary of state includes a large range of economic statistics in his report. Thus Ohio seems to be complying fully with the requirements of the law.

The PRESIDENT. The Chair would like to contribute a suggestion. The section of the law under consideration was enacted more than twenty-seven years ago, and since that time there has been a total revolution in the United States on the subject of statistics. Since then have been established every bureau of labor and every bureau of statistics.

Mr. MORROW. I think that if there were time to hear from all the States represented we should find that almost all the colleges try to carry out honestly the purpose of the law. I believe we have reached the time when further discussion of this question is valueless, and I therefore desire to make a motion.

The PRESIDENT. Will Professor Morrow withhold his motion for a moment?

Mr. MORROW. Certainly.

The PRESIDENT. Professor McInnis had risen to address the Chair. The Chair will now recognize Professor McInnis.

Mr. MCINNIS. I want to make a suggestion. Would it not be well for this Association to ask the Bureau of Education to prepare from the

reports and catalogues of the colleges an annual circular similar to the excellent bulletin issued by the Office of Experiment Stations giving the organization lists of the stations. If we want to know who is professor of English, or professor of mathematics in any college, we must now refer to the catalogue of that institution. I believe that if the Commissioner of Education were to publish an annual bulletin giving the lists of officers of the colleges, courses of study, etc., he would not only serve the convenience of those interested in these institutions, but aid in the improvement of their work.

The PRESIDENT. Professor Morrow now has the floor.

Mr. MORROW. I move that the subject under discussion be referred to the committee on the order of business, with a request that resolutions be formulated to embody the sentiment of the Association.

The PRESIDENT. The Chair suggests that as the committee on the order of business has a great deal of work to do, it might be better to follow our usual practice, and refer this subject to a special committee.

Mr. MORROW. I accept the suggestion and move the reference to a special committee.

The motion was agreed to.

The PRESIDENT. The Chair will appoint as the committee Messrs. Morrow, Hicks, Raub, Broun, and McInnis.

The Chair will at this time announce the special committee on relations of the colleges and War Department. Two of the members of the committee were provided for by the action of the conference; the remaining members of the committee will be Messrs. McInnis, Fairchild, and Turner.

The next order of business is the discussion of the subject, "Uniformity in the methods and records of chemical laboratories." The discussion will be opened by Professor Jenkins.

Mr. JENKINS. In order to save time, I have written out the suggestions I desire to make.

The PRESIDENT. Will President Murfee be kind enough to take the chair?

Mr. Murfee took the chair.

Mr. Jenkins read as follows:

The discrepancies in the results obtained by different chemists, in samples believed to be identical, have been notorious. Many of these discrepancies are in the samples rather than in the analyses, due to insufficient pulverization or carelessness in protecting samples from loss or gain of moisture during shipment and at the laboratory. But many and great discrepancies are not to be explained in this way. Business men, who have chemical work done constantly in the course of business, know of "high chemists" and "low chemists," that is, persons whose results will quite uniformly run higher or uniformly lower than the average of other chemists. Those stations which are burdened with the fertilizer control have full experience of the vexations due to this state of

things. An analysis made in one State laboratory is objected to by the manufacturer on the ground that nitrogen, phosphoric acid, or potash, or all of them run too low. He calls for a sample of the article, sends it to another station or to a trade chemist and gets results widely different from the first. As a consequence, a station or a chemist is discredited, each chemist distrusts the work of the other, and one or the other has certainly made a mistake which costs, or is likely to cost, some one money or reputation.

But these discrepancies have not been confined to fertilizer analyses. They have been even larger in the analysis of feeding stuffs, as may be seen from the reports of the proceedings of the Association of Official Agricultural Chemists, and these have been more likely to go unchallenged, from the fact that usually no one has such a pecuniary interest in finding and exposing them as there is in the case of commercial fertilizers.

It is morally certain that to-day our stations are turning off a vast amount of chemical work of very questionable accuracy; analyses are made by different methods, some of which are faulty, or by such modifications of conventional methods as give results which are not by any means comparable, or, again, with insufficient knowledge on the part of the analyst of the precautions required in manipulation.

For the last ten years I have compiled annually all the analyses, of vegetable products, published in this country, and have had abundant opportunity to satisfy myself of the truth of these statements. Indeed, in some cases, it has seemed pretty clear that certain chemists must have been unfamiliar with some of the simplest methods of quantitative analyses, such, for example, as the process of separating the alkalies from other bases, or of separating potash from soda.

It is of great importance that all possible measures should at once be taken to reduce these discrepancies and errors to their lowest terms. They will not wholly disappear until the chemists themselves are perfect. There is no one step to be taken which will entirely remedy the evil, but very much good may be done by insisting on the importance of following very closely, in all its least details, any method which is conventional in its nature. A "conventional" method is one by which it is sought to approximately determine a group of substances not identical and, it may be, not clearly defined but having certain common properties, such, for example, is the determination of fat or ether extract which includes all bodies, such as chlorophyll, wax, resin, organic acids, etc., which in a water-free condition are soluble by anhydrous ether.

The points which I would emphasize, in opening this discussion, may be briefly summarized as follows:

(1) It is of primary importance that the work done by the stations should be comparable as well as accurate.

(2) To secure this it is not essential that a single method should be everywhere followed for the determination of the inorganic constituents

of feeds, fertilizers, etc., nor for nitrogen, sulphur, phosphorus, and the like, which exist in organic combinations. On the contrary, wherever possible it is desirable that each laboratory should use dissimilar methods, or modifications of one method, for the same determinations, at least occasionally, in order to check its work.

(3) Wherever so-called "conventional" methods are employed it is essential that all analyses strictly follow both the same general methods, and, as far as may be, the same details of manipulation. To illustrate:

The methods of determining fat or ether extract, as it is now commonly and more correctly called, consists in exhausting the dry material with pure anhydrous ether, and drying and weighing the extract. If the material is not dry, or the ether not anhydrous, the results will vary widely, because of the extraction of sugar or other bodies insoluble in anhydrous ether, but soluble in water. Now, this is a purely conventional method. We know that it is not fat alone which is removed. We know that chlorophyl, resin, wax, organic acids, and perhaps other things are also extracted and weighed. Perhaps in extreme cases half of the extract may be something else than fat.

Why use this method, then? Because it is evidently the best thing we can do at present, in spite of the imperfections. It has been almost universally used. The fat, in practically all our analyses of feeds, has been determined in that way; and, what is vastly more important than this, in all the physiological studies which have been made regarding the feeding of our farm animals, this method of determining fat has been followed.

It may be urged that a low boiling petroleum benzine will dissolve fat and not wax, resin, or chlorophyl. If so, it may in time be substituted for ether, but use it now and you make your analyses worthless for comparison with others. You can not apply to them any feeding standards which experience has approved, and they work confusion when they drift into any compilation of analyses. Before benzine can be used we must have it proved that this article, which has no definite composition, but varies greatly according to the source from which it comes, has always the same solvent action on all kinds of fodders, and we must also know how the results compare with those obtained with ether on all classes of vegetable products as determined by a large number of carefully conducted analyses. I have used this only as an illustration. All the determinations in an ordinary analysis of a feed are purely conventional, and failure to strictly follow the prescribed particulars leads to great confusion and is at the bottom of much of the discrepancy between chemists and laboratories.

(4) Great good would result, in my opinion, if every station in the country which concerns itself at all with chemical work would annually send its chemist to the meetings of the Association of Official Agricultural Chemists, and would follow conscientiously and particularly the methods recommended by that association. I hope this Association of

Colleges and Experiment Stations will consider this matter, and, if it seems advisable, express its opinion formally by a resolution.

(5) It needs to be said, however, that strict uniformity of method will not entirely do away with these discrepancies. There is trouble very often in the analyst himself. A teacher of analytical chemistry of many years' experience once told me that about one in twenty of the young men who took a chemical course had the making of a good analyst in him, and that the proportion of first-rate chemists was much smaller.

The sudden and great expansion of agricultural experiment station work, following the distribution of Government money under the so-called Hatch act, has created a demand for well-educated young men, thoroughly trained in the methods of scientific investigation, and in the details of chemical analysis. There are too few such men in the country to meet the demand, and therefore the stations suffer, so far, I mean, as the chemical part of their work is concerned.

(6) Regarding uniformity in the records of chemical laboratories, I have nothing to suggest, unless this includes also the way in which the results of analysis shall be expressed when published. I submit that for feeding stuffs it will best serve the convenience of readers and students if the complete analysis—not simply the water content of the material, and the composition of the water-free substance—is given in the same condition, as regards water, as the material from which the sample was drawn; and also, if the complete analysis is reckoned to a water-free basis. For example: If a grass is analyzed, do not give its analysis with the water content which the sample had when air-dry. That will represent neither grass nor hay; nor simply say water, so much, dry matter, so much, and then give the percentage composition of this dry matter. In that case the reader must make a calculation of some length to find out what really was the composition of the grass. But give the composition of the fresh grass in full, and then its composition reckoned on the water-free basis. This shows two things at a glance, what the material in its natural state actually consisted of, and how it compared with all other feeds when the variable water is eliminated. These are, in ninety-nine cases out of a hundred, the things one wants most to know, and they can not be more concisely shown than in this way. It would be a help to all who have any compilation of analyses to do if every one followed a uniform order in naming constituents. The following order is the one most commonly employed: Water, ash, protein or albuminoids, fiber, nitrogen-free extract, fat or ether extract. This order I have followed in my published compilation for the last ten years, and though the order is not a thing of great importance, it is yet a convenience to have it uniform.

And, finally, let me say, though perhaps not exactly germane to the subject, that it is surely appropriate and extremely desirable that each

station where chemical work is done should contribute to the study of analytical methods with a view to their improvement, or to the devising of other and simpler methods in their places. Preparatory to this is the investigation of the approximate constituents of feeds, dairy products, etc., a line of work which requires wide acquaintance with chemical literature, requires a great deal of time and patient work, and is often barren of immediate results, but is yet very necessary to our further progress.

The PRESIDING OFFICER. The next speaker is Professor Collier, of New York. Is he present?

Mr. ATWATER. He is not here.

The PRESIDING OFFICER. Then the next speaker, according to the programme, is Professor Stubbs, of Louisiana. I believe he is not present. The next is Professor Stockbridge, of Indiana.

Mr. STOCKBRIDGE. Dr. Jenkins has, with marked ability, covered the entire ground, but there are one or two points to which I wish to call your attention, in order to emphasize what he has already said. I refer particularly to the division of the subject under discussion into two parts: (1) methods; (2) records.

Accuracy of statement is just as important as correctness of method. Let us take one or two illustrations of difference in statements.

Some stations in publishing analyses of certain fertilizers, give the "ammonia;" others state the "nitrogen;" some give the phosphoric acid as "soluble," "insoluble," "reverted;" others as "soluble" and "citrate soluble." These expressions really mean one and the same thing, but of this many farmers are ignorant. It should be remembered that our publications are made chiefly for the use of farmers, and that varying terms are confusing to them.

We can without change of method make our statements more accordant, so that our results will be, as Dr. Jenkins says, more easily comparable. For instance, if it is obligatory to state the ammonia, as in the case of Indiana, it is easy to state the nitrogen also in another column.

There is an Association of Official Agricultural Chemists for the purpose of selecting best methods. I believe that in justice to ourselves and other workers, the station chemists ought to accept the methods proposed by that association, and, so far as possible, to stand by them.

Mr. SCOVELL. I want to say one or two words on behalf of the Association of Agricultural Chemists, in regard to uniformity of methods.

Take potash, if you will. The association appoints a reporter who sends samples to every official agricultural chemist who will undertake to analyze them by the method of the association or by any other method he chooses to adopt. He reports his result giving his method. Thus is determined the suitability of a method for general adoption. If found unsuitable, another method is tried.

I was one of the reporters last year. In return for the samples, and

indeed before they were sent out in some cases, came twenty letters stating that the writers did not have time to analyze the samples, or that their superior officers did not allow them time for this work. Unless work of this sort is done we can never reach uniformity of methods.

Mr. ARMSBY. I have listened with a great deal of interest to what has been said on this subject. But it seems to me that it is too technical to be profitably discussed very fully by an association like this, and too technical for this association to take any very definite action upon.

We have already in existence, and have had for six or seven years, an Association of Official Agricultural Chemists, which is devoting its attention especially to this subject of uniformity of methods of chemical analysis, with the purpose of eliminating false methods and the testing of methods of approved chemists, for I understand it is one of its objects to test the chemists as well as their methods. In view of the importance of this subject, it seems to me exceedingly desirable to bring about some sort of co-operation or union between this Association and the Association of Official Agricultural Chemists. I do not think it necessary that one association should swallow the other, but it seems to me that this Association ought to take advantage of the existence of the other; that we ought in all possible ways to support, sustain, and co-operate with that association, and that it, rather than this Association, is the organization which should give authoritative decisions upon the matter of chemical methods.

Mr. ATWATER. I wish to indorse the suggestion of Professor Armsby.

Mr. MYERS. I had the honor of presiding over the last meeting of the Chemists' Association and wish to say that the association would be glad to hold its meetings at the place and time of the meetings of this Association. It was found impracticable to do so this year. It is probable—I say this as a member of the executive committee of the Chemists' Association—that in the future it can be arranged to have these meetings come together, at least upon alternate years.

I want to say that all processes proposed by that association are founded upon the most careful studies made in the line of chemical analysis in this country, or anywhere else, for that matter. That association can compare its work with any similar work in the world. It not only tests methods, but men as well. Many of the best chemists of the stations belong to the association, and all of them ought to belong to it. It is important for all to attend the meetings of that association and touch hands with their comrades in study. They will find there wide-awake men, thinking men, men who are not afraid to say honestly when necessary, "Gentlemen, we don't know." The chemists are willing to acknowledge their limitations. Some men say, "We know it and that settles it." [Laughter]. Some chemists who do not understand chemistry any too well, say "This or that is so; we found this or that to be the fact within one-thousandth of 1 per cent. It is not one fraction more or less." [Laughter.] The members of the association,

however, are not so positive, for when we compare our work we find that there is a limit to man's skill.

It strikes me that the best thing this Association can do is to recognize the work that has been done and is being done by others. As President Gates said this evening, the stations ought to commence their work where others have left off, utilizing the work already done, not only in this country but in other countries as well. The Chemists' Association is investigating very carefully this subject of chemical methods. Why bother about it here?

Mr. HENRY. I would like to interrogate Mr. Myers, president of the Chemists' Association, upon a few points. By the confessions of one or more chemists, we have ascertained that their investigations are very imperfect, and that within certain limits their work is incorrect. As a director employing chemists, I would like to know what these limits are. For instance, we are told that two chemists can not exactly agree upon the amount of moisture in a given substance. If the disagreement is very great I shall in the future regard such analyses with less confidence than in the past. When we were children we looked upon ministers as heavenly creatures; but as we grew older, we probably found that they were very much like our fathers, were indeed quite an ordinary sort of men. Our farmer friends have had the childish regard for chemists, believing what they said to be absolutely true, because they usually work out their results to the third decimal. [Laughter.]

Now, if President Myers will allow me, I will ask him two or three questions. I do not mean to pin him down. I would like to know about how closely three or four chemists of his association would agree in a determination of the amount of water in a sample of hay.

Mr. MYERS. The very best chemists would differ from three to five tenths in a moisture determination.

Mr. HENRY. That is, where there were 12 to 14 pounds of water in 100 pounds of hay?

Mr. ATWATER. The variation would be from three-tenths to five-tenths of a pound in 100 pounds of hay.

Mr. HENRY. How much would the nitrogen determination vary?

Mr. MYERS. Probably not more than one-tenth of 1 per cent.

Mr. HENRY. Multiply it by $6\frac{1}{4}$ to get the protein?

Mr. MYERS. Yes.

Mr. HENRY. Now, let me ask you in regard to milk analyses. [Laughter.] How much would you expect two chemists to vary in the amount of fat in milk?

Mr. MYERS. That question we are investigating at present, and it is impossible from present experience to state how great a variation ought to be expected. We had at our last meeting the first comparative results; judging from them, it is large.

Mr. HENRY. What percentage?

Mr. MYERS. It is impossible to state at present.

Mr. HENRY. Not 1 per cent.?

Mr. MYERS. No.

Mr. COOKE. Three-tenths of 1 per cent.

Mr. HENRY. How much, Dr. Jenkins?

Mr. JENKINS. I have no opinion to offer.

Mr. HENRY. Is the gravimetric ether test a fairly accurate method?

Mr. JENKINS. It is an extremely accurate method. The chemists in my laboratory would not vary one-tenth of 1 per cent. I have had made from 50 to 60 analyses in which the average difference was less than one-tenth of 1 per cent.

Mr. HENRY. This seems to me a serious matter. There are State laws requiring certain percentages of fats and solids in milk, and such variations as have been stated here to be possible might perhaps cause men to be fined \$25 or \$50. It seems to me that the question of variation affects the people directly. I want to be ready to stand with you or against you, and now that you have confessed your sins, I want before you leave us to discover your virtues if indeed there is anything good in you. [Laughter.]

Mr. MYERS. The difference between the chemist and other people may be that the chemist acknowledges his faults, while the others do not. The farmer weighs his hog very carefully, but he finds it impossible to put him on scales and weigh him as delicately as the chemist weighs his quantities.

Mr. ARMSBY. Will he make the pig weigh the same twice?

Mr. MYERS. Yes, but within ten minutes of his first weighing he can not weigh him again and get the same result.

I have just gone through the methods of testing milk, as recommended from Wisconsin (Short's method), and find a variation of as much as one-half of 1 per cent., using the same sample of milk and the same scales. These variations must be taken into consideration. The man who goes on the witness stand to sustain laws that are passed inconsiderately has a pretty hard task before him, as the chemists know.

Now take feeding experiments. No chemist has the hardihood to say that a determination of the fat in a given feeding stuff by the ether extract method shows how much fat that feeding stuff will produce when fed to an animal; nor that a protein determination shows how much muscle a feeding stuff will produce. We say simply that analyses show such quantities of fat or protein. How much an animal can use is one of the great problems for the future. Analyses should be regarded as approximations to the truth, not as the absolute truth.

Mr. JORDAN. Chemical work with all its inaccuracies is extremely accurate.

SEVERAL DELEGATES. That is so.

Mr. JORDAN. Professor Henry, if I may refer to him, in reporting to his constituents the results of his feeding experiments, assumes and teaches confidently certain facts as the basis of his experiments. Were he interrogated as closely as he has interrogated the chemists to-night he

would be obliged to face more uncertain elements than exist in chemistry. So I think it is a little unfair to arraign the chemists so severely after they have confessed their faults and inaccuracies.

Mr. ARMSBY. I trust the discussion will not take too personal a turn. We may all confess we are all "miserable sinners." [Laughter.] As my professor used to say, "There is nothing quite accurate." It is simply a question of the degree of accuracy, whether the work be chemical or feeding or anything else. We must not take results as absolutely true, but carefully inform ourselves of the limits of error and use results accordingly.

Mr. HICKS. The important question to be considered in any case is whether given methods of determination are sufficiently accurate to furnish a practical conclusion in that case. I think, for instance, the moisture determinations of these chemists here to-night would be sufficiently accurate to be used in awarding the prize of \$500 offered by the American Agriculturist for the best acre of corn. Fifty pounds of the corn are to be tested for moisture by the experiment stations. I think they would all undertake the test as our station has. It may be true that the chemists can not determine absolutely just how much moisture there is in the sample sent to them, but they can determine it so closely that no injustice will be done to the competitors. The American Agriculturist wrote to me in regard to a competitor in Nebraska who had obtained a very remarkable yield, desiring that a moisture test be made with the utmost strictness to determine whether this man should take the prize. I replied that I had placed the matter in the hands of the chemist of our station, Professor Nicholson, and that his determination might be taken with perfect confidence. I should write the same thing again after all that has been said to-night, for, after all, the practical question is, Will the method give a fair result? If it does, it is accurate enough. You don't want a razor to cut down a tree.

Mr. NEALE. I fear that some may go away to-night with a bad impression of American chemists. I want to tell Professor Henry and the other gentlemen of the convention that American scientists are respected throughout Europe as much as we respect European scientists. A year ago last summer I spent considerable time in the experiment stations of Germany, Holland, and Belgium, and I found everywhere that they looked up to our association of chemists with a great deal of respect, and were preparing to organize a similar association.

I found in Germany that the chemists have far more serious differences than we have had here. I want to assert that our chemists are as accurate as any in the world, that their methods are as good as any, and that they are doing more than any other chemists in the world to perfect their methods. [Applause.]

Mr. ATWATER. It has been my lot to be among the chemists Dr. Neale has spoken of as well as among American chemists. I believe every word he says to be exactly true.

Mr. ROBERTS. I was surprised by the statement of one gentleman, that in return for samples sent to official chemists at some of the experiment stations in order to test the station chemists—I suppose that was the object—and bring them into harmony with each other, replies were received stating that the governing authorities of those stations would not allow the chemists to analyze these products. Am I right?

Mr. SCOVELL. They were not allowed the time, or they had not the apparatus. The work was declined.

Mr. STOCKBRIDGE. This discussion has at least shown our interest in this subject. I move that a committee of three be appointed to report upon this topic at the meeting to-morrow.

Mr. ROBERTS. I second that motion. If there are any chemists on this continent that need to be expert and accurate they are the chemists of the agricultural experiment stations.

The motion was agreed to.

The PRESIDING OFFICER. I will appoint on that committee Messrs. Stockbridge, Myers, and Jenkins.

Mr. ALVORD. The discussion of subjects upon the programme having been concluded, I suggest that if any of the gentlemen present have subjects that they desire to have referred to the committee on the order of business to be placed upon the programme, or any resolutions which they desire to present for future consideration, they should do so now. The committee will probably have a meeting before the hour of assembling in the morning.

The PRESIDING OFFICER. What is your wish, gentlemen? If there is no further business a motion to adjourn is in order.

Mr. HENRY. I move that we adjourn.

The motion was agreed to, and at 9.50 p. m. the Association adjourned.

SECOND DAY.

MORNING SESSION, WEDNESDAY, NOVEMBER 13, 1889.

The Association was called to order at 9.40 a. m.

The PRESIDENT. Is there any miscellaneous business to be presented by the committee on the order of business?

Mr. ALVORD. The question box ordered yesterday has been provided, in which may be put questions or subjects that delegates wish placed on the programme. It is recommended by the committee that resolutions to be considered by the Association be offered to-day—and now, before the first discussion opens, is a good time—that they may be given a place on the programme for consideration.

The Commissioner of Indian Affairs, having expressed a desire for an opportunity to say a few words to the convention regarding the agricultural work at the various Indian agencies, has been invited by the committee to be present to-day at 11 o'clock, and, under the resolution passed yesterday, he will then be accorded the privilege of the floor for the purpose of making a brief address. If time permits after the forenoon programme has been completed the committee proposes to submit to the Association for consideration resolutions of the American Forestry Association.

The PRESIDENT. The offering of resolutions is now in order. (A pause.) If there are no resolutions, is there any miscellaneous business to be presented by any member of this Association? If not, the first discussion on the programme is, "What amendments to the Hatch act are needed?" The first speaker is Mr. Dabney, of Tennessee.

Mr. DABNEY. Finding myself assigned to open the discussion on this subject, I was afraid the executive committee supposed I was a radical. I want to say once for all that I am intensely conservative on all subjects, and particularly so on this one. You remember the advice a certain sage gave a young couple who were about to commit matrimony—my speech may be epitomized in his—"Don't."

Really no changes occur to me that need to be made in the Hatch act. But it has been suggested that the fifth section, the one that makes the appropriation, might be amended. I like an appropriation as much as any other American citizen; but still I am opposed to increasing the appropriation at present. We have really been working under this act only about one year. It took about a year to get organized. Let us do something before we ask for increased appropriation. I most earnestly counsel that we let the Hatch act alone.

The PRESIDENT. President McLouth, of Dakota, is the next speaker on the programme. As he is not present, the Chair will call on Dr. Neale.

Mr. NEALE. It is clearly the feeling of this convention that the Hatch act should be let alone. Amendments will doubtless have to be made sooner or later; but I am willing that a considerable time should elapse before taking any steps towards such changes.

The PRESIDENT. Professor Porter, of Missouri, is next on the programme.

Mr. PORTER. I have been making an examination of the Hatch act to find some point on which to make suggestions, but I am well convinced that it would be very poor policy indeed, at this period of the operation of the law, to attempt any change in the act. The most important experiment before us at the present time is the experiment station itself, and I think that it is altogether too soon to attempt to make any changes in the act.

The PRESIDENT. The subject is now open for discussion by the Association.

[NOTE.—Here were offered two resolutions in regard to the management of the station finances which led to a lengthy discussion, all of which are omitted from this report by order of the Association.—EDITORS.]

The PRESIDENT. The chairman of the executive committee is now ready to present some business.

Mr. ALVORD. It is suggested that a communication from the American Forestry Association be now read. The recording secretary of that association, who signed the communication, is present in the convention in case there is any desire to ask further questions on the subject.

The PRESIDENT. The communication will be read.

The SECRETARY. The communication is as follows:

WASHINGTON, D. C., October 29, 1889.

DEAR SIR: In accordance with the instructions of the American Forestry Association at its recent meeting in Philadelphia, I send you the accompanying transcript of the record of its unanimous action in reference to our agricultural colleges and experiment stations, and their relation to instruction and experimentation in regard to forestry, and respectfully ask that this record be presented to the Association of which you are the honored secretary.

I have the honor to be, very respectfully,

N. H. EGLESTON,

Recording Secretary American Forestry Association.

Prof. CHAS. E. THORNE,

Secretary of the Association of American

Agricultural Colleges and Experiment Stations.

Whereas the people of the United States, by an act of Congress, have appropriated public lands for the establishment and endowment of agriculture and the mechanic arts in the United States, with such liberality that the funds of these colleges so endowed now amount to not less than \$15,000,000; and

Whereas, with like liberality, the people of the United States have recently supplemented their former action by the appropriation of \$15,000 annually to each State for the support of an experiment station, in connection with the agricultural college of such State; and

Whereas the forests of the country have large and important relations both to agriculture and the mechanic arts, the latter deriving from them annually materials

of the value of not less than \$300,000,000, yielding manufactured products valued at twice that sum, and the former having in the forests meliorating influences, barriers against the mechanical violence of sweeping winds, and the mitigation of their chilling or desiccating effects upon crops, as well as the beneficial action of forests as preventives of floods and droughts ; and

Whereas, by reason of ignorance, inconsideration, and the reckless spirit of greed which is too prevalent, we are consuming our forests at a rate which threatens, in the not distant future, the gravest evils to our agriculture and our mechanical industries : Therefore,

Resolved, That it is the sense of this Congress that our agricultural colleges should regard it as one of their most manifest duties to give the subject of forestry a prominent place in their curricula of instruction, and that every experiment station should engage in investigating and making experiments in those branches of forestry which have special importance in the localities in which they are situated, or which are of general interest to agriculture and the arts :

Resolved, That a copy of the record of this action be respectfully presented to the Association of American Agricultural Colleges and Experiment Stations.

The PRESIDENT. The Association has heard this communication. Under the order it would be referred to the committee on the order of business. Does the Association wish to give any instruction in regard to the disposition to be made of the paper ? Shall it be entered on the minutes as a part of the proceedings of the Association ?

Mr. MORROW. I move that it be placed on the minutes of the Association.

The resolution was agreed to.

The PRESIDENT. We have nearly reached the time set for hearing the Commissioner of Indian Affairs. He is present with us, and if it is the pleasure of the Association, I will now ask General Morgan to address us.

I have the honor to introduce General Thomas J. Morgan, Commissioner of Indian Affairs.

Mr. MORGAN. I am very happy to have the privilege of meeting with you for a few moments and of speaking about a department of Government educational work which stands in very close relation to the work done in the colleges which you represent.

According to the best information, there are in the United States about 250,000 Indians. Of these, some 66,000, belonging to what are called the five civilized tribes, make provision for their own education and do not come under the immediate oversight of the Government; leaving about 180,000 for whose education the Government is directly responsible.

If we estimate the number of Indians of school age, those from six to sixteen years of age, at about one-fifth of the population, there are, approximately, 36,000 for whose education the Government should provide. Dr. Harris, the Commissioner of Education, estimates the percentage of the population of school age in the United States, taken as a whole, at about 23½ per cent., but I think it would be less among the Indians. Many of the Indian youths, owing to a great variety of causes, which I need not take up your time to specify, can not be reached. So

I have supposed we might possibly succeed in enrolling in the schools about 75 per cent. If we secure an average attendance of 21,600, I think we shall do remarkably well, considering the average attendance in our public schools in the older and more settled parts of the country, where we have the help of home influences.

The problem set before the Government at the present time is, then, What shall be done for the education of these 21,600 Indian children scattered throughout the western States, Territories, and reservations?

As you are all doubtless aware, there has grown up in the last few years a system of day schools and boarding schools on the Indian reservations, and of other schools removed from the reservations. There was an average school attendance last year of about 11,000. It is the purpose of the Indian Office to extend its work and secure the attendance of all Indian youth that are accessible, as fast as Congress will put at its disposal sufficient funds to erect buildings and organize schools.

The point that is especially attracting the attention of the Indian Office at present is the grading of the schools, the bringing them into some organic relationship. As there is at present no necessary connection between the schools, they all attempt the same kind of work. To illustrate, there is a school at Lawrence, Kans., called the Haskill Institute, having about 450 pupils. Of these, a large proportion, say 75 per cent., are little children, the proper subjects of primary education, and really having no place in a school of the character of the Institute.

The present plan is to develop a high school course in three Government schools: one at Carlisle, Pa., where some of the children are now pursuing high school studies; another at Lawrence, Kans.; and a third at Chewawa, near Salem, Oregon. Within the present year high school studies will be organized, and the students belonging to the lower grades of schools will be replaced by others capable of pursuing the higher grades of studies.

I have with me a paper in which the details of this plan are fully set forth. I shall be happy to give a copy to any gentleman wishing it.

You may ask what you have to do with this matter. The great feature of these schools is, and for the next ten years surely, and probably for the next twenty-five years will be, industrial education. The Indian boys are to be taught farming and the rudiments of the industries of civilized life; and the girls are to be taught the industries peculiar to the home.

There are, in connection with many of the boarding schools, what are called industrial teachers, but when I investigated their work I was surprised to find that they had no very definite idea of what the work of an industrial teacher should be. It has seemed to me—and this is the point to which I wish to call your especial attention—that there might be found in the various agricultural colleges young men of special training who could be employed to take charge of industrial work in the Indian boarding schools. I corresponded recently with my friend Dr. Peabody, President of the college at Champaign, Ill., and secured

from him the nomination of a young man to be sent to the industrial boarding school among the Navajoes. I have reason to think that the selection was wisely made. It has seemed to me that if we could secure from among the young men you are educating, some endowed with good common sense, having the ability to adapt themselves to the environments (if I may use a much abused word) of an Indian reservation, to work in the industrial schools in training young Indians in the use of tools and in the work of the garden and farm, we might bring the Indian boarding schools into very close relation with those great schools with which you are connected, and that we might hope for the very best results in giving the Indians the practical education which will enable them to earn their bread and butter. The scientific element of education can be looked for in the institutions you represent.

In the conduct of the Indian schools I have met with two antagonistic ideas, ones with which you are very familiar. On the one hand, it is insisted that the Indians should be taught practically and always by practical workers; that is to say, that they should be taught farming by practical farmers, trades by practical mechanics, etc. On the other hand, it is claimed that the work should be intellectual work, so that the Indians may be brought to a high degree of intelligence.

I need not say to you that, with the Indians, as with any other class, these two ideas must come together and be harmonized. The man who is following a trade is not necessarily qualified to teach that trade to others. We must secure for teachers of the industries, and in some instances as superintendents of the schools, those who, to a practical knowledge of trades and farming, add the higher intellectual training, the broader outlook which comes from scientific study in institutions such as yours, if we are to lift the great body of Indian youth to the high plane of independence which will fit them for the duties of American citizenship.

This, in brief, is the object I had in mind in responding to your invitation. I wanted to look into your faces. I wanted to put myself into relationship with you. I wanted to invite your co-operation in this great work. I wanted, if practicable, to get from you recommendations of young men fitted to take part in this work which the Government is now earnestly undertaking.

The Indian reservations are destined at no distant day to disappear. Within twenty-five years all the Indians must be absorbed into the national life, and the only solution of the problems connected with their change from semi-savages into productive American citizens, is to be found in a system of practical and at the same time, scientific instruction. I shall most heartily welcome the co-operation of any of these gentlemen in this work, which appeals to you on the ground of economy, because the Government is spending in this work millions of dollars, which you are anxious to see expended so as to produce the best results; which appeals to you on the ground of patriotism, because it is

the changing of 250,000 savages into citizens; which appeals to you on the ground of philanthropy, because it is the lifting of a great mass of people from barbarism to civilization. (Applause.)

The PRESIDENT. The Chair is sure the Association has listened with very great interest to the remarks of General Morgan. Has any one a motion to propose which will express the sense of the Association?

Mr. ALVORD. I am sure that I express the sense of the Association in moving that the Association tender its thanks to the Commissioner of Indian Affairs for his interesting presentation of an important subject, and that a special committee of three be appointed by the Chair to further confer with Commissioner Morgan in relation to the subject which he has just presented.

The motion was agreed to.

The PRESIDENT. The Chair will appoint as the committee Messrs. Alvord, Gates, and Fairchild.

We are now ready for the discussion of the next topic.

Mr. ARSMBY. The subjects which come before the Association for consideration may be divided into two classes: questions of administration, and technical questions, relating to the practical details of the work of the colleges and stations.

In order to facilitate the discussion of these two classes of questions, I introduced at Knoxville a proposition for amending the constitution, which I will read. It will be found at page 98 of the Knoxville Proceedings:

There shall be two permanent sections of the Association, to be known as the "college section" and the "experiment station section."

The object of these sections shall be the discussion of such matters relating to the work of the colleges or stations as from their technical nature are unsuited to the general meetings of the Association.

It shall be the duty of the executive committee, in arranging for each meeting of the Association, to provide for separate meetings of the sections, allowing such time therefor as may seem expedient, after consultation with the chairmen of the sections, and to include the programme of such meetings in the general programme.

The officers of each section shall be a chairman, who shall be *ex officio* a member of the executive committee of the Association, and a secretary. They shall be chosen by ballot, and shall hold office from the close of the meeting at which they were elected, until their successors shall be elected.

The chairman shall preside at the meetings of the section: he shall also arrange for the meetings of the section in connection with each meeting of the Association, and, in conjunction with the executive committee, prepare the programme for the same.

The secretary shall keep as full a report as possible of the meetings and discussions of the section, and furnish the same to the secretary of the Association for incorporation in its proceedings.

This amendment was referred to the executive committee and was reported back with the recommendation, which was adopted by the convention:

That the consideration of this amendment be postponed until the next annual meeting of this Association, and that Dr. Armsby be requested in the mean time to furnish a copy of the proposed amendment to the director of each experiment station and to the president of each agricultural college.

It is this amendment which comes before us this morning as a basis of discussion.

I wish to say, in the first place, that the discussion of technical questions is a matter of growing importance for this Association. The former meetings have naturally and rightfully been occupied with the discussion of administrative questions, and I have no words of criticism whatever for the action of the executive committee in placing these subjects upon the programme. But we have now discussed most of these questions pretty thoroughly. Some of them are settled and will stay settled. We do not need to thrash the old straw over again. It seems to me that if this Association is to hold the interest of its members and to secure profitable and well attended meetings more time must be given to the discussion of those questions relating to the work of the stations and colleges, which I have called technical questions.

I think this is coming to be very fully recognized. The executive committee has left in the programme for this meeting very considerable space for the discussion of questions of this sort without specifying the particular questions to be discussed. The horticulturists have almost an organization of their own for discussing such questions. The entomologists desire to discuss that subject in connection with the meetings of the Association. The Association of Official Agricultural Chemists has been discussing for several years such questions in their department, and I understand that they now at last propose to hold their meetings in connection with those of this Association. So it seems to me the tide is setting in the right direction.

But it is not only the chemists, botanists, and entomologists who need these discussions. The agriculturists and directors need them as well. They need to consider methods of experimenting as well as methods of administering affairs. The making of experiments is important work, and experimenters need to meet together and discuss the methods of experimentation. Those interested in agricultural instruction feel, I suppose, the need of discussing methods of teaching, methods of illustrating, methods of combining book instruction and practical instruction in the field, and other like topics. I believe you will all agree with me in my first point, which is that we need in connection with the meetings of the Association opportunity for the discussion of this class of questions.

In the second place, we should so arrange matters that we may meet together for the discussion of these questions with the greatest possible economy. During the past year the station which I represent paid the expenses of its director in attending a meeting in Washington in March to consider the question of field experiments. We sent our horticulturist in June to a meeting of horticulturists in Columbus, Ohio. We sent the chemist of the station to Washington in the latter part of August to the Association of Official Agricultural Chemists. And now the director comes here to meet others for the discussion of matters relating

to the general work of the station. I should be very glad to bring my whole station staff to these meetings, but we cannot afford it. I do not feel that the station can afford the expense of sending its director to all these several meetings, and yet, I, as a director, want to know what the horticulturists, chemists, botanists, and agriculturists are talking about. We want something more than printed results. We want to know the tone and spirit of the meetings. We want to hear the specialists talk and know what topics are uppermost in their minds. If we can combine these meetings in one, all coming to one place and staying until the work is done, I think these objects can be accomplished at very small expense. There will be the further advantage that the members of the different staffs, many of them young men, will be brought into contact with the men who usually gather at these conventions.

In the third place, I think that the section meetings should have a definite programme outlined beforehand. We had a very interesting meeting of the experiment station section, if we may call it so, yesterday afternoon, but we met under a disadvantage in not knowing what we were going to talk about. We elected a chairman and a secretary, and then we sat and looked each other in the face and wondered why somebody did not say something. Of course it did not take us a great while to get a start, but I believe we could have used our time to better advantage if we had had a programme and had known beforehand what subjects were going to be up for consideration. In that case, speakers might have made preparation on special subjects. One gentleman interested in digestion experiments said he would have been glad to have brought some models and appliances for experiments of that kind had he known the subject would be discussed.

In the fourth place, I think we should avoid too much subdivision. I think there has been a tendency to divide up too much. There was a proposition before us yesterday to divide into three or five sections this evening for the discussion of special topics, and to hold the meetings, as I understood, simultaneously. That plan did not seem to me desirable. It seems to me unwise for the horticulturists, for example, to confine themselves to a meeting of their own, coming into the convention of the Association only to present results of their work for indorsement. They would be liable to lose interest in the work of the general convention, and at the same time, the convention would be liable to lose interest in them. We are all one body and ought to hang together. Moreover, all need to know what men in other lines of work are thinking about, and we want to hear the discussions on various lines of work.

In the fifth place, I think these meetings should be not only open to all members of the Association, but, so far as practicable, convenient in time for them. Programmes might be so arranged that though some meetings were simultaneous, few members would want to be in two places at the same time.

Finally, I think that whatever plan be adopted to secure the desired ends, ought to be flexible, as simple as possible, and involving but little machinery.

The amendment I have read seems to me a simple and easy method of reaching the desired end, providing for a division into sections and leaving open the question of further subdivisions. I will not speak further upon this branch of the subject, because the question of means is not important. What I am anxious for, what I think very important, is that we shall attain the desired ends. I do not care particularly as to the means. If some better means of reaching the end is proposed, I will vote for it with both hands. [Laughter.]

The PRESIDENT. President Chamberlain not being present, the next speaker is Dr. Whitney.

Mr. WHITNEY. I agree with what Dr. Armsby has said in the main, but I do not think this a matter which should be treated in the form of an amendment to the constitution.

The thing proposed is essentially to divide the Association into two sections, a college and an experiment station section, looking to a probable further division into subsections of horticulture, stock-feeding, etc. With my present light, I shall oppose the adoption of this amendment, as I do not think the Association large enough or strong enough to justify such a division at present.

The Association embraces the interests of the colleges and experiment stations. If it be thought that the colleges no longer need representation here, that their interest in the Association ended with the passage of the act establishing the stations, then I, for one, as a representative of one of the colleges, am willing to see this an association of experiment station workers. As it is, however, many if not most of the delegates present have an interest in both the colleges and stations. Many of the directors are also presidents of colleges, and others of us have equal interest in both. I do not see why we who attend should be debarred from the discussion of any matters pertaining to our position.

Further, this amendment will undoubtedly give rise to greater subdivision, and here again our interests so overlap that it is almost as important, if not more so, for us to hear what others are doing as to discuss work within our own particular narrow lines.

With our interests so mutually dependent I do not want, when I go to a meeting where station and college work is being discussed, to go into a room where only horticulturists are meeting, or into one where only methods of teaching are being discussed. I want to hear what all say, because all is of direct interest and value to me as an officer of a college and of a station. A divided association is too much like the four ring circus.

Our lines of work are not widely separated, like geometry, history, biology, mineralogy, as in the American Association for the Advance-

ment of Science. I know my place there. We must not forget that our stations and colleges are still small. Many of us teach or work in many branches, and our general object is the same, the advancement of agriculture and the education of the agriculturist. My own position, for instance, embraces, in addition to the vice-directorship of the station, the professorship of agriculture, horticulture, animal husbandry, and meteorology in the college. Doubtless others present have the same wide range of duties.

Further, the many associations which we all want to attend, the American Association for the Advancement of Science, the Society for Promoting Agricultural Science, and the Association of Official Agricultural Chemists, make no small tax on the pocket. This Association, unless it meets in connection with some of the others just mentioned, will be less generally attended after a year or two, and there will then be probably at no time more than four or five specialists in any one line present.

It will not be necessary to devote much time hereafter to administrative matters and the executive committee might designate times on the programme for the discussion of technical subjects, or all technical matters might be referred to standing committees with orders to bring matters before the Association at appointed times. Let these committees on horticulture, stock-feeding, and the like, be appointed for one year and let all matters relating to these subjects be referred to these committees to be brought before the convention and discussed in full session in such manner as may seem advisable.

MR. MORROW. I have found it extremely difficult to balance the arguments for and the objections to the amendment proposed by Dr. Armsby. The members of this Association have distinct and diverse, but I hope in no case opposing, interests. Most of us are interested in both the colleges and the stations. Yesterday afternoon, when the convention divided into two sections, the question arose, "Which section shall I attend?" At Knoxville, I was a delegate from our college. Here I am a delegate from our station. My interests, as Dr. Whitney's, are so much with both sections that I can not tell in which they chiefly lie. I believe that we ought to magnify the common interests rather than by subdivision risk what we recognize as a danger—the narrowing of the influence of the Association. I have decided to draw the line on no division at all, that is, any arbitrary and permanent division into sections.

My thought is that for the present we will do best to leave the executive committee in arranging the programme, to provide for the discussion of special subjects. I would regret the multiplication, even under the flexible plan of Dr. Whitney, of meetings held at the same time.

It is clear that the discussion of administrative questions is nearly finished, and that hereafter technical questions will be discussed more and more. I am not a chemist, but I listened with great interest to the

most technical expressions used in the very interesting discussion of last night, and I am sure that as a botanist, a horticulturist, as anything else, I ought to be interested in what pertains to our work as a whole.

One word more: I do not want to be understood as lacking interest in the work of the stations. Our executive committee has shown wisdom in making it the chief subject of discussion, but I can not agree with the statement made soon after the Knoxville meeting, that the words "Agricultural Colleges and" had no place in the title of this Association. That was perhaps true of that meeting, and, I think, wisely so; but I think that as the years go by we shall see that the discussion of methods of improving our educational work has not been finished. I hope that next year there will be much attention given to the discussion of educational questions; and I believe our friends, who are at present in connection with the experiment stations only, will be able to help and will be both interested and profited by the discussions.

Hence, I think it would be wise not to divide into permanent sections, but to remain as one Association, giving the executive committee instruction to provide in advance of each meeting for the discussion of special questions.

Mr. DABNEY. It seems to me that this Association stands at a crisis in its history. It is obvious to me that interest in the general matters which have occupied the Association in the past is waning. The most interesting subjects which have come up at this meeting are those discussed yesterday afternoon in the meeting of the college presidents and in the meeting of experiment station workers.

The general sessions of this Association have been conducted in the past by the college presidents chiefly, and properly so. The conditions required that it should be so. But I have noticed that the experiment station men have been rather bored, have not been so thoroughly interested as they should have been.

It seems to me this should be a grand Association. It represents agricultural education and agricultural investigation in America. If we count the college professors engaged in agricultural education and the station workers, we have two hosts, more or less combined, the same individual standing often in both camps, which ought to make a grand Association.

Gentlemen speak of the danger of too much division, the danger of small subsections consisting of four or five men. Gentlemen, if we divide to the utmost that is proposed, what is the result? Take the agricultural chemists for example. We have in this country at least forty agricultural-chemists who should be in attendance at our meetings, but if only one-half of them came, we have twenty men, enough to form an excellent working subsection. And so with the rest. I need not go into details further.

One gentleman has spoken of the four ring circus. I do not think

that a fair comparison, so let me make another one. Where there is life and growth there must be differentiation. The physiological botanist tells you that when the first cell of some low form of vegetable life begins to grow it divides and another cell is formed which may develop into a new form. And so the growth continues, cells developing on the original parent stem, having different functions and structure and different composition. That is life; that is life everywhere, life animal, life vegetable. It consists in the differentiation of cells.

Now, if we are going to grow, as I believe we must if we are to interest all, we must grow as the plant grows, by developing different circles of interest—one for the agriculturists, another for the botanists, another for the horticulturists, another for the entomologists, and so on.

This ought to be a grand Association. It ought to be of scarcely less importance than the American Association for the Advancement of Science. If we bring together our college professors interested in scientific work and our experiment station workers, there is no reason why we should not have splendid general sessions of college presidents and experiment station workers, separate meetings for the directors and for the college presidents, and also meetings of subsections. We ought to spend four or five days every year, having our meetings so arranged that all delegates shall be able to attend nearly all meetings, so arranged that the directors may drop into the meetings of the agricultural chemists, or into the meetings of the horticulturists, at least for a part of the time.

I thus briefly outline what it seems to me must be the development of this Association if it shall continue to grow and be useful. And I believe that if something be not done to interest the different classes of men, this Association will almost die—it will certainly be paralyzed to such an extent that it will meet only occasionally at Washington when it wants to get something done by Congress. For one I think it will hardly pay me to come to these meetings if the discussions are to continue on the plan followed in the past. I am hungry to get into a meeting of directors of experiment stations, and into one of agricultural chemists; and if I can not get them I think I shall not come again, and I think I can say the same for most of my brethren with whom I am intimately acquainted. As Dr. Armsby has said, we have thrashed the old straw over thoroughly, and if there is to be nothing new we will not thrash it any more.

Mr. FAIRCHILD. I agree with both sides. [Laughter.] It has struck me, in listening to the debate, that it is possible for us, not an unwieldy body, to adopt a method for accomplishing our purpose very similar to that adopted by the National Council of Education, with which many of us are familiar.

Let us have committees of institutions, not of men, on the various subjects. Let our executive committee from year to year designate the committees, which shall report at the Association meeting. Thus, let us have at one meeting reports from the committee on horticulture, on

entomology, and on the directorship; and at another, reports from the committees on college work in connection with the stations, on education, on agriculture, and on chemistry. This plan would lead to the wisest selection of the men to be sent as delegates, for it must be recognized as a fact that we can not send a whole college or station to the convention each year.

In this way it seems to me possible to combine all interests.

Mr. JENKINS. I think it is the general, if not the universal, feeling that we come together to hear all we can, and that all of us would desire to hear everything said in all the sections into which the Association might be divided.

Now, it occurs to me to make the inquiry whether such a scheme as this might not be practicable. We will suppose the convention in session as usual, having a programme duly prepared. For the first hour and a half, we will say, the entomologists of the different colleges and experiment stations have things their own way, and the discussion is on entomology. For the first hour the discussion is confined to specialists, some appointed beforehand, presenting papers on special subjects. I do not care how technical they are; I want to hear them. Though the discussion be on some particular insect pest that I know nothing about, I shall be interested and, to a considerable extent, instructed. At the close of the hour there are fifteen minutes for general discussion, for suggestions, or for questions. Then, at the end of the time, the botanists have their turn. Thus all subjects are taken up, a chance for general discussion being given in every line. Let each interest have two turns during the week.

It is important that I should hear not only what the directors or the college presidents are talking about, but what the vegetable pathologists, the botanists, the bacteriologists are saying in order to get the greatest good out of the meeting. And, as Dr. Armsby has said, it is a very cold thing to read the proceedings of the Association. We do not get the spirit as we do in seeing and hearing.

Mr. JORDAN. I feel like saying something in explanation of my intention to vote with the mover of this amendment.

As I came here, I anticipated most pleasure and profit in getting into a corner somewhere with Dr. Jenkins and Dr. Armsby to talk with them about some feeding matters. There are many things I would like to hear, but I can not take in everything. I can not understand everything even in the lines of work which I represent.

The work of the stations is investigation, and as investigators we want to get all the help we can about our main business, that of investigation. I would like very much to hear what the entomologists say, but there is too much to know and hear of what men are doing with feeding problems and with fertilizers to allow time for it. I agree with the gentleman who last spoke (Mr. Jenkins), that there is not the time during any meeting for all of us to listen to the discussion of all lines of

work. We know how hard it is to get through with such a programme as we already have.

Mr. SPEER. The action of the Association on this amendment will decide my future action as the director of the Iowa Experiment Station. Yesterday I thought that I wanted my chemist, my entomologist, and, indeed, all the workers of the experiment station present at the next meeting of this Association. But the expense of bringing the entire corps of workers to a meeting is more than a station can bear unless they derive more benefit from it than they could from this Association without division into sections. I am interested in the prosperity of the colleges. Before I became connected with the station I was a member of the board of trustees of the Iowa Agricultural College, and I do all I can to advance the interests of the agricultural colleges. But I come here as an experiment station worker, and I would like to bring all the workers of my station with me. It is impossible, however, in four days to discuss all the questions I would like this meeting to consider.

I will suggest that the meetings of this Association should be held nearer the center of the country. Last year I was glad to go to Knoxville. This year I wanted to come to Washington. But if we are to bring together the entire staffs of the stations at the meetings of the Association, we must make the expense as light as possible.

Mr. THORNE. Yesterday afternoon we divided temporarily into two sections or conferences, one of college presidents and the other of experiment station men. The first, as I learned from a resolution reported from their conference, discussed a question in which I and most of those who went with me into the second conference had no interest whatever. I have no doubt a large portion of the discussion of the experiment station workers would have been as uninteresting to the college presidents as their discussions to us. And yet these questions were of prime importance, ones which it was absolutely necessary to discuss and consider.

At the close of the conference of experiment station workers a committee was appointed to prepare a programme for another meeting this afternoon. That committee was given considerable authority, and if the committee will permit me, I should like to report the arrangement decided upon. It was that when the conference was called this afternoon the committee should recommend that the conference divide into several subsections, subcommittees or whatever you choose to call them; one to consist of horticulturists, another of entomologists, another of botanists, and another of agricultural chemists. These committees or subsections were to consider for an hour and a half such questions as they thought fit to bring before the general Association. At the conclusion of the hour and a half, the committees or subsections were to come together in a general conference, and to submit to it the questions they had decided upon as being of most pressing im-

portance. It seems to the committee that this method would save the time used in the discussion of details not of general interest, and would secure as far as possible general discussion of those subjects which specialists consider most important.

I have the impression that the American Association for the Advancement of Science is attended chiefly by college professors. I would like to ask whether the college governing boards pay the expenses of the professors who attend the association? No. Meetings are held every year and entail great trouble and expense. The rate for railroad travel is seldom less than one and one-third of the regular rate for a round trip. Nevertheless the meetings are very largely attended. They are enormous gatherings of scientific and intellectual workers; professors feel that it is necessary to attend them in order to keep themselves fresh, quick, and alive in their work—to speak briefly, in order to enable them to earn their salaries.

Now we have a convention of workers in the special line of agricultural education and research. The questions that come before us are materially different from those which come before the American Association for the Advancement of Science, but they are fully as important. I ask, is it right that we demand that this experiment station fund given for the special purpose of agricultural research, from which we are paid what I consider liberal salaries in proportion to those given to other workers in science and education, should be drawn upon to pay our expenses in attending this Association? Gentlemen, we in Ohio feel that we can afford to put our hands in our own pockets occasionally and use a little of our own money to enable us to attend these meetings. We have adopted a rule—I say we have adopted it; we have not, but it is at present in effect as a rule—that the station shall pay the expenses of each worker during the year in attending some meeting in which he is especially interested. I came to Washington a year ago to attend a convention of field workers. We sent our entomologist to the meeting of the American Association for the Advancement of Science, at Toronto, to attend the entomological session. Our horticulturist attended a meeting at Columbus, and would have been sent to it had it been held in any other part of the United States. But I am in serious doubt whether our rule is a good one, whether our fund should be taxed with the traveling expenses of any of the station force sent to any meeting of this character. I think we ought to be willing for the purpose of keeping ourselves up with our work, to attend one meeting a year at our own expense.

It is very evident, as has already been said, that we can not afford to attend a half dozen meetings. Then let us get together somewhere once a year for the discussion of all questions of importance to us, and let us pay our own expenses. When we come together let us, so far as possible, discuss every question pertinent to our work. It is evident if we provide for sections, we can not all attend the whole series of

meetings, but we can avoid any serious loss by adopting one of the plans suggested. It has been proposed to refer questions to committees of specialists for their opinion as to the advisability of further discussion. I do not see that it makes any difference what we call these committees, but I think it very important that they be constituted properly. Each committee should include, without formal appointment from any authority, all the specialists in the line of work assigned to it. There would then be no chance of packing committees. Everything would be free and open.

Gentlemen, I sincerely hope that some definite, clear cut provision will be made for the work of this character.

Mr. GATES. The value that we of New Jersey place upon these conventions is best indicated by the fact that we have in attendance today the horticulturist and botanist of the College Station, the senior chemist of the State Station, and a member of the board of managers of College Station, as well as the president of the college, and that nothing but illness prevents the attendance of the entomologist of the College Station. I speak of the matter because I want to be very clear in recognizing the high value of these conferences to agricultural science. Since we can not wisely divide in space, I believe we may well divide in time.

I share the feelings of those who want to learn as much as possible at these conventions. I have more need to learn than most of those here, because my interest has not been turned in this direction until recently. I confess a growing interest in every department represented in this convention. Yesterday afternoon I had a great desire to be present in both sections. So far as I am a representative of the colleges I say that they are quite ready to assume a secondary place in this convention, provided it be clearly recognized that the reason for doing so is that the agricultural experiment station is an important department of the college. We, as college men, are here as such because we are interested in the operation of the Hatch act. It is that, primarily, which brings us together. I am sorry to hear any speak of ignoring the colleges in the name of the Association; I do not think it ought to be done. The law recognizes the Hatch stations as branches of the State colleges.

It seems to me that we can attain both of the objects that have been stated here, and without any very sweeping amendments to the constitution. It is worth while to be patient when we are shaping such an institution as this. It involves the harmonious working together of many minds, and that requires patience. I believe in specialization of function everywhere as a mark of life. But, whatever we do, we should work unitedly and harmoniously. Let us have specialization of function with unity and harmony of motive. I believe we can attain our objects by provisions that shall be neither radical nor sweeping.

I believe, for instance, that we might do so in this way. For a four-

day convention let the executive committee prepare a programme and circulate it at least three weeks before the first day of the meeting. I do not intend in the least to criticise the action of the executive committee this year, but it is very important that we should have two or three weeks' notice if we are to prepare papers worthy of being read here, for many of us have engagements for months in advance. With the programme in hand, governing boards would select as delegates those workers who could probably obtain most profit from the meeting. Suppose the programme to contain for the first day general papers and discussions. For the second and third days there should be a carefully prepared programme on subjects pertaining to station work, representing as many departments as possible, and the time for discussion should be so divided as to allow opportunity for such practical discussions as seemed to me the best things in the Knoxville convention. Let each discussion follow carefully prepared opening papers. I know we obtained benefits from such discussions last year.

It is very important for us to bear in mind all through that we are working under an act, the design of which was investigation with the ultimate object of the diffusion of agricultural knowledge among the people of the United States. I doubt whether anything has done more to carry to the minds of the farmers a readiness to give their sons a good agricultural education than the knowledge that in the agricultural colleges they will obtain practical ideas of the value of different chemical fertilizers. That sort of education must be continued. We must continue to study methods of getting results for the farmers in the best way. If we are split up into small sections, I believe that will not be possible, but if we have brief and pointed discussions following well-prepared papers, investigation and the diffusion of knowledge will go together.

But further, let us provide for specialization. Suppose the fourth day were given to subsections. Plans could be made in these subsections for the following year's work. I should be very sorry to see the name of the Association changed, but the sections ought to be so named that a man sent to one should not question his right to go into the other. [Applause.]

MR. HADLEY. I am pleased with most of the remarks made, because they voice what is in my mind. The arrangements for meetings make comparatively little difference to the gentlemen who live near the place of meeting, for it does not cost them much to attend; but when you travel two or three thousand miles, attendance must recompense you for the outlay of a great deal of money. It seems to me that the time of the meeting might well be lengthened a little; it might be even six days instead of four. The main difference in cost would be in the hotel bills for the two additional days. That is a slight difference. With us from a distance the main item is that of railroad travel. I like Dr. Gates's plan for a division of the time of meeting by the executive com-

mittee so as to give opportunity for general discussions, and for the most technical, the programme so arranged, that those who especially wish to attend the general meetings can attend the technical meetings or not as they desire.

Mr. DAVENPORT. I was surprised when we divided into sections yesterday to discover that all the sour apples had been put into one basket and all the sweet ones into another. I listened during a whole afternoon to things that did not concern me at all. I learned that the advertisement of the colleges should not be printed on the back of station bulletins; I do not care anything about that. I also learned something about the effects of drinking.

I think the directors are benefited by what is done at these meetings. But it certainly would be better if we could make our discussions more definite. I am to report to our board of agriculture a scheme of experimentation, and what I want is details. I want plans for that work. How am I to get them? I have heard the term physiology mentioned but once in the course of this meeting. I have heard reports sustaining agricultural chemists and others, but I have heard the term physiology mentioned but once, and many other things that intimately concern all who are concerned in field experiments have not been mentioned here. We must devise some plan by which workers in each line can confer together and learn from each other the best methods for their own work.

Mr. HENRY. The reference of the gentleman from South Carolina (Mr. Whitney) to the four-ring circus was very pertinent. But, like most very striking figures, it admits of more than one interpretation. Why do we have a four ring circus? Only because the crowds are so big that it is necessary. Otherwise the people would not all be able to see the circus. As it is, you and I almost get cross-eyed in trying to watch all four rings at the same time. [Laughter.] But we go. If the circus continues its present popularity we have got to go with a crowd, and that means more than one ring.

To send a man to the meetings of the Association costs us from \$75 to \$100, and nearly forty-eight hours of travel. The eastern gentlemen it does not cost so much. I think the gentleman from Ohio (Mr. Thorne) made a very good suggestion. I think I ought to pay half of my expenses and so save enough money to let another man come to these meetings. I am very glad of the suggestion and shall adopt it.

I have been wondering whether I could afford to send our horticulturist and chemist to these meetings. Aside from what information he would get by talking with other delegates in the hotel or on the way to the meeting, I do not see that our horticulturist would learn enough here to pay me for sending him. I do not believe my chemist would get enough information to compensate for all the time and money the trip takes and for the disarrangement of work during his absence.

Now, let us have something like what President Gates suggested, with enough differentiation to make it pay to send our workers here.

Let us directors remember how when we were boys we thought it would not be a bad idea if our fathers would sometimes stay home to milk the cows and let us go to the town to see the circus or watch the parade. We head men of the institutions are drawing on our \$15,000 fund pretty liberally to pay our own traveling expenses. It might be well if we would sometimes stay at home, milk the cows ourselves, and let the boys come to the meetings.

Mr. ATHERTON. I look upon this movement as one of the most important and serious in the history of the Association, but one that is welcome, nevertheless, for it is necessary to our growth.

I thoroughly sympathize with the purpose of the resolution offered by Dr. Armsby, but I think the adoption of it in its present form would be a serious mistake. Dr. Gates used a happy figure. Our interests are entirely harmonious. They are necessarily interdependent, and yet specialized. We have an outside relation, we must not forget—a relation to Congress and to the public, as we represent all the interests mentioned in the Hatch act. In order to carry out our common purposes, we must maintain such unity in our organization that when we move we shall move as one body. The voice of the Association has had effect, because it has been understood to express the judgment of all the interests represented here; and anything that would impair our unity would immediately leave us without weight with the public authorities.

As has been suggested, the Association was formed in consequence of the passage of the Hatch act. Before that time there was no association of agricultural colleges. The Association represents in its organization a number of interests not directly referred to in the Hatch act. The stations are under the college trustees, and all the workers in the colleges are interested in the work of the stations. There is not a single branch of work, except some very narrow specialty, in which we are not all alike interested. The directors of the stations are surely interested in knowing what is the thought of the educational institutions, and the colleges are certainly interested in knowing what is thought and done by the directors and other station workers.

Yesterday afternoon I regretted that I could not be in two places at once. In both sections there were questions to be discussed in which I felt an interest. I suggest this. Almost all the important questions respecting the organization and operation of the experiment stations under the Hatch act have been settled; almost all the questions concerning our relations to Congress or to the Department of Agriculture have been settled. The time used in adjusting ourselves to our relations has accomplished its purpose. It may seem to some that this has been time wasted, but not one question has been considered which was not thought to be of serious concern to the Association, and had these questions not been considered patiently and quietly, we never could have reached our present position as an Association; indeed, we should not

now be in existence as an Association. Now that we have cleared the ground, will it not be well to try some plan which will give opportunity for considering not only general questions, but technical questions as well?

Dr. Gates' plan, it strikes me, is entirely feasible. President Fairchild's plan seems to me more desirable. If one man in each department were to bring before the Association the results of his own best thought and investigation plus the results of the best thought and investigation of others throughout the world, to serve as the nucleus of discussion, should we not have discussions of interest to all and instructive to all? They would be a positive contribution to our own knowledge and a positive contribution to the knowledge of the community. President Fairchild's suggestion seems to me to have this great excellence.

While listening to the discussion and trying to formulate my thought I struck upon a suggestion which I will offer, to be referred perhaps to a proper committee later. I suggest:

(1) That the executive committee, in preparing a programme for the next convention of the Association, be directed to ascertain as far as practicable, by correspondence, what questions members of the Association desire to have considered, and, as far as possible, to assign sufficient time for discussion of all subjects so proposed.

(2) That general sessions of the Association be held in the forenoons and afternoons only.

I am willing to say forenoons only, or forenoons and evenings.

(3) That the evenings, except that on which the president's annual address is to be delivered, be left for meetings of sections.

Mr. DABNEY. I move that Dr. Armsby be allowed five minutes in which to conclude the discussion.

The motion was agreed to.

Mr. ARMSBY. I have been exceedingly gratified by the interest awakened and by our substantial unanimity in regard to the objects which we want to accomplish.

The discussion has been almost entirely upon the best means of reaching a desired end. As I said in my opening remarks, I do not wish to push the particular scheme which I happened to hit upon, but yet I will take a moment or two to call attention to one or two points in regard to it:

(1) In regard to preserving the unity of this Association. It was not my feeling that the amendment, in the form I proposed, would at all affect the unity of the Association or its unity of action. It was not my thought that the proposed division into sections would be a fixed arbitrary division; that each man would be assigned, or would assign himself, irrevocably to a certain section. It was to be rather a division in organization, a provision in the first place for a programme for the special meetings; and in the second place, for a very simple organization. It was not my idea that any of the sections would assume to act in the

name of the Association, but that all matters of business, all resolutions, anything to which it was desired to attach the weight of the name of the Association, would be reported in the general meetings of the Association for action, exactly as has been done during the present meeting. Nor was it my thought that the amendment would necessitate simultaneous meetings of the sections; that was a matter which could be left entirely to the executive committee to arrange in making up the programme.

I have no sympathy with the "getting-into-a-corner" method of discussing questions. This thing should not be done in a corner. [Laughter.] We want the discussions of technical questions where all can get at them.

It has been recommended by the committee in charge of the meeting this afternoon that the Association divide into sections. I see no reason why provision for such division could not be attached to this amendment, or why—and this would probably be better—the sections proposed by my amendment could not divide in this way without any special provision in the constitution—simply splitting into committees, if you please. I would say further that the plan proposed by Dr. Jenkins is applicable to the meetings of sections proposed under this amendment.

I move that a committee of five be appointed by the chair to take this subject into consideration and to report to the convention to-morrow.

The motion was seconded.

The PRESIDENT. You have heard the motion. Are there any remarks to be made?

Mr. ARMSBY. May I amend my motion to make the committee include the president of the Association?

Mr. ROBERTS. It appears to me that the motion does not provide for the consideration of the question: How are we to get our workers to these meetings?

The PRESIDENT. The chair would suggest that that is a little different question. It might be referred to another committee. It is purely a practical question for the stations. The motion of Dr. Armsby is that a committee of five, with the addition of the president of the Association, be appointed to consider this subject and report to-morrow.

The motion was agreed to.

The PRESIDENT. Will Dr. Roberts bring up the other subject now?

Mr. ROBERTS. I am not ready with my motion, but I will bring it up at some suitable time.

The PRESIDENT. The chair will announce the committee at the opening of the afternoon session. The hour for lunch having now arrived, the convention stands adjourned until 2 o'clock.

At 12.26 o'clock p. m. the convention adjourned.

AFTERNOON SESSION, WEDNESDAY, NOVEMBER 13, 1889.

The Association was called to order at 2.15 p. m.

The PRESIDENT. The first thing in order is a communication from the committee on the order of business.

Mr. WILLITS. Before the committee on the order of business makes its announcement, I wish to say a word about the reception this evening. The programme has the reception at the Ebbitt House, but Secretary Rusk, feeling heartily in sympathy with the work of the institutions represented, desired to meet the delegates socially, and insisted that he was the man to hold the reception.

I add to his my wish that all the members of this Association, their ladies, and friends who may be with them, be present this evening. We shall have present some other scientific gentlemen connected with the Department, the Smithsonian Institution, or the National Museum. The invitation is extended heartily and we hope to have such a response that it will be clear that the Association and the Department are in complete sympathy in their work. [Applause.]

Mr. ALYORD. I wish to announce that there will be vehicles here at 8.15 to carry forty persons directly from this building to Secretary Rusk's house. There is no further announcement from the committee on the order of business, as the programme will be followed this afternoon as printed; that is there will be no general session after the sections have had their meetings.

The PRESIDENT. The Chair will announce as the committee upon the amendment to the constitution, provided for during the discussion this morning: Messrs. Armsby, Henry, Gates, Fairchild, and Dabney. The president of the Association belongs to the committee by the vote of the Association.

Mr. CLUTE. I introduce the following resolution:

Whereas Messrs. Lawes and Gilbert, of Rothamstead, England, have for about fifty years, conducted most valuable experiments in agriculture, the results of which they have published in the "Transactions of the Philosophical Society," the "Journal of the Royal Agricultural Society," the "Journal of the Highland Agricultural Society," and in other publications; and

Whereas an abstract of these important experiments, in which the methods pursued and the results attained should be clearly stated in convenient and accessible shape, would be of great value to the workers in our agricultural colleges and experiment stations; therefore,

Resolved, That we, the delegates from the American agricultural colleges and experiment stations, do hereby request Hon. J. M. Rusk, Secretary of Agriculture, to have such abstract of these experiments prepared and published at as early a date as possible.

Whereas experiments in nearly all departments of agriculture have been, for many years, conducted in France, Germany, and other European countries, the published results of which are not generally accessible to our agricultural colleges and experiment stations, but which would be of great value to our workers in showing them what has already been accomplished, and enabling them to avoid needless reduplica-

tion, and in showing them the methods of work which experience has proven to be most valuable; therefore,

Resolved, That we, delegates from the American agricultural colleges and experiment stations, in convention assembled in the city of Washington, do hereby petition Hon. J. M. Rusk, Secretary of Agriculture, to have the transactions of foreign agricultural and horticultural societies carefully examined by competent persons, and abstracts of important experiments made, stating methods and results, and the same be published in convenient form in English as an aid to our agricultural colleges and experiment stations, and as a benefit to American agriculturists in general.

The PRESIDENT. These resolutions will take the usual order, and the Chair wishes to state that there is a special reason for following the order in this case. The Department is planning to do precisely the thing requested, and it may be that by consultation with the proper officers of the Department their views may be so far embodied in the resolutions—I think there is no conflict between their views and those expressed in the resolutions—as to insure united action. I know that it is the purpose of the Department to ask for funds to do such work during the coming year.

Mr. CLUTE. It occurs to me that the passage of these resolutions by this body might perhaps have an influence upon the Department of Agriculture in expediting the work. Our experiment stations are very much in need of the information for which the resolutions ask.

The PRESIDENT. The suggestion of the Chair that the resolutions in taking their usual course would perhaps be modified was not expected to prevent the expression of opinion of the Association.

There being no further resolutions, is there any further miscellaneous business? If not the Association will now adjourn until 7 o'clock this evening, to meet this afternoon in sections.

Thereupon, at 2.30 p. m., the Association adjourned.

EVENING SESSION, WEDNESDAY, NOVEMBER 13, 1889.

The Association was called to order at 7.23 p. m., Vice-President Murfee in the chair.

The PRESIDING OFFICER. I have the pleasure of introducing to you this evening our honored president, who will now deliver his annual address.

PRESIDENT ATHERTON. Gentlemen of the Association, I am sorry to be obliged to read an address, but I shall save your time and my own by so doing.

Gentlemen of the Association: The gratification which we all feel in this renewal of intercourse, has been so often expressed that it need not now be repeated. But, aside from the mere pleasure of companionship, the occasion forcibly impresses one with a sense of the importance of the work undertaken by this Association, and with the feeling that these annual gatherings are not the least important of the many agencies which it has brought into requisition. That nearly four hundred trained men, located in various parts of our country, are engaged in the same

or in parallel lines of work, is of itself a fact of the utmost significance, but when to this it is added that these men, starting from a few generally accepted scientific principles, are endeavoring to apply them in their several localities to the needs of that great industry upon which all others depend; are periodically publishing their results, and thus submitting them alike to the scrutiny of science on the one hand and of practice on the other; and are then, at the rounding up of each year, coming together in convention to discuss the best methods of carrying on this great work, it is impossible not to be impressed with a serious sense of the responsibility of the position occupied by this Association. It is doubtful whether any of the original friends and promoters of the movement, which was finally formulated in the "Hatch act," had, or whether we ourselves have, any adequate conception of its far-reaching scope.

Leaving these general considerations and such special topics as will come before the Association for consideration during the course of our present sessions, it may not be unprofitable to consider at this time a subject which lies at the foundation of the legal status of the institutions represented in this body, a subject which has already been, and will hereafter be, much discussed; but about which it is highly important that the country at large and the institutions concerned should have clear and definite views—that is, the relation of the colleges to the stations under the "Hatch act," and in that I mean to include both the legal relation and the associated relation which has sprung up, and is embodied in this organization. Upon the first point there can be no serious differences of opinion. To all intents and purposes, it would be correct to say, as a general statement, that in the eye of the law wherever college and station exist as a part of the same organization the college is the station and the station is a department of the college. The proof of this proposition is clear and direct. The act of 1887 itself, by its title, proposes to establish agricultural experiment stations in connection with the colleges established in the several States under the land grant act of 1862. These stations are, by the terms of the law, placed directly under the control of "the college or colleges or the agricultural department of colleges" established or to be established in the several States and Territories. The funds appropriated by the Government for the maintenance of such stations are to be paid "to the treasurer, or other officer, duly appointed by the governing boards of said colleges to receive the same." An exception to these provisions is made in favor of agricultural experiment stations separately established by State legislatures previous to the passage of the "Hatch act," and of certain classes of agricultural colleges or schools subsequently established; but these exceptions serve merely to emphasize the main features, and to bring out more clearly the true intent of the law in its primary and principal operation. That intent was to enable the colleges to carry on such lines of experiment and research as it had

been found they were not able to do with the resources accruing from the original land grant.

It is probably no injustice to the promoters of the act of 1862 to say that they had a very vague and inadequate idea both of the ends which it was practicable to attain in the direction in which they were seeking, and of the best means to be employed even for such ends as were clearly within their view. Their general and controlling aim was, no doubt, to promote agricultural education, and by that they meant not simply the general diffusion of agricultural knowledge among the agricultural community, but the specific education of youth who were then employed, and were thereafter to be employed in agriculture as a pursuit. They expected not so much to help farmers in their daily toil as to prepare farmers' boys to engage in similar toil with a clearer knowledge of the processes and means they were employing and of results to be expected. They cherished the idea of combining intelligence with labor in such a way that the intelligence should be made directly available and the labor directly lightened. Experiments in this direction had, as is well known, been already attempted in several States. In Michigan, in Pennsylvania, in Maryland, and possibly elsewhere, institutions had been established for the sole and avowed purpose of promoting agricultural education of the kind already indicated. It is no reproach to the promoters of such enterprises to say that they had not in their minds any clear distinction between what could be and what could not be wisely undertaken. The whole field was new and experimental, and they, as pioneers, were simply blazing a path into an untrodden *terra incognita*.

Some of the men who were engaged in these local movements actively interested themselves to give them wider scope and recognition, by securing the intervention and the aid of the United States Government. This effort, as is well known, received the sanction of Congress in 1859, but the bill was vetoed by President Buchanan. The law then defeated was, however, passed in 1862, under the leadership in the Senate of the same able and far-seeing statesman who had previously given it the weighty sanction of his judgment, his support, and his leadership in the House.

His legislative career will forever be identified with that great measure, and as successive generations come and go, its wisdom and beneficence will more and more give splendor to his crown of public service. I need not, in this audience, name the name of the honored and beloved Senator from Vermont, Justin S. Morrill. [Applause.]

The fact to be emphasized in respect to that law is, that its great aim was not only to promote learning, but to keep distinctly in view its applications to industry. Senator Morrill himself well expressed its purpose when he said :

It is perhaps needless to say that these colleges were not established or endowed for the sole purpose of teaching agriculture. Their object was to give an opportunity for those engaged in industrial pursuits to obtain some knowledge of the practical sciences related to agriculture and the mechanic arts; such as they could not then

obtain at most of our institutions called classical colleges, where the languages, Greek and Latin, French and German, absorbed perhaps two-thirds of all the time of the students while in college.

But it never was intended to force the boys of farmers going into these institutions so to study that they should all come out farmers. It was merely intended to give them an opportunity to do so, and to do so with advantage if they saw fit.

Obviously not manual but intellectual instruction was the paramount object. It was not provided that agricultural labor in the field should be practically taught, any more than that the mechanical trade of a carpenter or blacksmith should be taught. Secondly, it was a liberal education that was proposed. Classical studies were not to be excluded, and, therefore, must be included. The act of 1862 proposed a system of broad education by colleges, not limited to a superficial and dwarfed training such as might be had at an industrial school, nor a mere manual training such as might be supplied by a foreman of a workshop or by a foreman of an experimental farm. If any would have only a school with equal scraps of labor and of instruction, or something other than a college, they would not obey the national law. Experience in manual labor, in the handling of tools and implements, is not to be disparaged; in the proper time and place it is most essential, and generally something of this may be obtained either before or after the college term, but should not largely interfere with the precious time required for a definite amount of scientific and literary culture, which all earnest students are apt to find far too limited.

To these wise and weighty words no addition need be made. This summing up of the meaning of the law by the author and sponsor of the law leaves no room for doubt or question as to its primary intent and object.

This measure avoided the mistake which had been committed in some localities of laying too special emphasis upon manual labor. It did not require the teaching of agriculture nor of any other art, but it required the teaching of "such branches of learning as are related to agriculture and the mechanic arts." It did not exclude such other studies as are needed to widen the intellectual horizon and train the intellectual faculties. It recognized the correlation of all learning, and the subordination of all to the one great aim of the law, by forbidding the exclusion of any other scientific and classical studies besides those which were to promote the leading object of the institutions thereby established. It recognized experimental work and original research as a part of the function of such institutions, and the debates preceding the passage of the law clearly indicate that this field of their work was looked upon as offering most promising results; but these debates repeatedly, clearly, and strenuously emphasized the fact that the institutions were to be teaching institutions; were to be "colleges" of liberal education; were to prepare men for "the several pursuits and professions in life;" and were to bring these high benefits within reach of the "industrial classes."

What has just been said applies as well to the subject designated in the law, "mechanic arts," as to agriculture. The term mechanic arts must be interpreted under the law in the same broad and liberal sense as has been already indicated for the other branch of the subject. The term is and was undoubtedly meant to be elastic, comprehending the highest as well as the lowest branches. But, as must be observed here

also, the law does not require the teaching of the mechanic arts, or of any mechanical practice whatever; it requires the teaching of "*such branches of learning* as are related to the mechanic arts." If workshop exercises, or any other kind of mechanical practice, is taught, it must be only for the purpose of better teaching the underlying branches of learning, and not for the sake of the practice itself. It is needless to attempt a specific enumeration of such branches, even if it were possible to make an exhaustive catalogue. But the scope of the whole clause under consideration may be fully and exactly summarized by saying that it necessarily includes the teaching of all those branches of natural, physical, and mathematical science which underlie the industries of modern life, and the knowledge and application of which differentiates modern industry from all preceding forms.

Under the operation of a general provision of this kind, it will be natural to anticipate that institutions established for the purpose of carrying it into effect would vary in character, according to local needs and opinions. The law of 1862 favors this process, by providing that the institutions thereby established shall carry on their work "in such manner as the legislatures of the States may respectively prescribe." This anticipation has been strikingly fulfilled. According to the census of 1870, forty-four per cent. of the population of the United States were then engaged in agriculture; thirty-three and one-half per cent. in commerce and other industrial pursuits; and the remainder, twenty-three and four-tenths per cent., in professional and domestic occupations. Now it happens that in nineteen of the States, or just one-half of the whole number, more than fifty per cent. of the people are engaged in agricultural pursuits, the proportion ranging from fifty-one to eighty-three per cent. and averaging fifty-nine and one-half per cent. In all but one of these States the land-grant institutions have devoted their work more to the branches relating to agriculture than to those related to mechanic arts, and with one or possibly two exceptions the exclusively agricultural colleges are found in this list. On the other hand, the institutions which have found themselves impelled to give more attention to the other branch of the law, the teaching of the branches of learning related to mechanic arts, are found almost exclusively within the States in which an average of only thirty per cent. are engaged in agriculture.

The reason for this diversity is obvious. In a State like Kansas, for example, in which sixty-four per cent of the population are engaged in agriculture, a young man going out into the world finds nearly six and a half chances for employment in that branch of industry as against only three and a half in all other branches. While in a State like New York or Pennsylvania he finds eight chances for employment outside of agriculture as against only two in it.

In this general grouping, exceptions are, of course, to be found. There is probably in the whole number of institutions no one which has

not given at least a portion of its efforts to the advancement of agricultural science or practice, with whatever limited resources or in however half-hearted a way. On the other hand, not one can be found which has not of necessity taught, more or less fully, the branches of learning related to mechanic arts. But the broad general statement remains true, as just made, and is to be regarded not as a departure from, but as a true application of the spirit of the law.

To say that the institutions failed, in many cases, to make their instruction sufficiently practical to meet the expectations of the public, whether in the one direction or the other, would doubtless be a valid criticism, but that arose, as has been indicated, neither from defect in the law nor, necessarily, from a misapprehension of its meaning. It was a natural, not to say an unavoidable, consequence of the untried nature of the undertaking to which they were committed.

If, now, it be asked whether it was desirable for the Government to interest itself in this direction the answer is twofold. First, liberal education is the necessity of a free government. We boast of our common schools, and rightly. The generosity with which our people contribute to their maintenance is recorded in figures more eloquent than words, which show that the several States are annually expending an aggregate sum of \$150,000,000 for public-school education. The doctrine is everywhere maintained among our citizens that "a government of the people, for the people, and by the people" can only be perpetuated on the basis of the people's intelligence; but the history of education shows, the world over, that there can be no such thing as a satisfactory system of education for the masses of the people unless it be fed by a large and liberal provision of higher education. The higher education is as the ocean to the mountain springs—continually sending back the dew and the rain to supply them; it is as the tree to the fruit—continually imparting vitality and substance; it is as the sun to the planets—holding all in their appointed course. From the higher institutions come not only the teachers to lead and guide the lower, but that great body of learning and intelligence which creates, molds, and enriches the public sentiment which supports the common schools. From them also come those researches which widen the bounds of knowledge, which discover new treasures, which rejuvenate old areas of thought and keep alive in the minds of men those high ideals which form the inspiration and the guide of all noble life.

I have recently had occasion to give some attention to the efforts made by the British Government for the diffusion of art and science among the masses of the people, and one of the most striking and suggestive facts in that record is, that when the efforts to promote this kind of teaching began they were checked at every turn by the lack of properly trained teachers, and among all efforts of the Government in this direction none has been more systematic, exacting, and persistent than the effort to train teachers. For this purpose the Government has made

and is still making large annual grants, and has built up in the National School of Science at South Kensington one of the best equipped institutions for this purpose to be found in the world. This history repeated in every land, and is the familiar fact in the development of its own public school system in the United States. The lower grades of education have been everywhere, and must continue to be, good whether high or low, according to the excellence of the system of higher education by which they are nourished and fed.

The second branch of the answer is supplied by the law declaring its object to be to promote the liberal and practical education of the "industrial classes," and this provision which gives the human sympathy, as well as of the broadest statesmanship, to the law, was intended to bring the aid of the Government to the relief of those who could not otherwise hope to secure the privilege of this law was to bring within their reach.

The only meaning at that time attached to the word "liberal" was a place of liberal education, comprising a four years' course of intellectual discipline and training, with a long preparation for itself beyond the reach of large numbers of aspiring youth. Obtaining a college education required time and freedom from other obligations, which not all could command. The youth of the humblest origin and with most meager resources came and were overcoming all these obstacles, and this condition in the United States has been that it has always been beyond the reach of many of the very poor, and of nearly all the circumstances who might wish to avail themselves of it. The purpose of the law of 1862 was to go farther than this, to bring the resources of the nation to the aid of those who could not help themselves. Nor do I imagine for a moment that it was upon them or since as an act of charity; it was rather a recognition. It recognized the fact that all the influences tend to stimulate the moral and intellectual development, to make up character and citizenship; that these influences are widely diffused among the masses of the people, and that they could in no way so readily serve itself—could it not establish the foundations of free institutions—could it not train men for useful public service as by the application of a portion of its wealth to promoting among the people higher education.

The history of those institutions has fulfilled the hopes of their founders.

In thirteen States the grant was made over to universities, and has served to establish or to augment the number of departments, or schools of applied science in the same States the fund has served as the chief source of support, or as the nucleus around which have collected funds far exceeding the amount derived from the national government.

I do not find complete statistics accessible, but from the latest Report of the United States Bureau of Education it is shown that twenty-four colleges have property amounting to nearly \$7,000,000; that the productive funds reported from twenty-six colleges amount to \$10,000,000 more, and that these colleges show a higher average of endowment than any other class of institutions in the country except theological schools. They employ about 700 professors and teachers, and are giving instruction to 10,000 students. Considering the smallness of the original grant, the new and untried pathway upon which the institutions were compelled to enter, the difficulty of procuring properly trained teachers, and the vagueness of the views entertained by even the most intelligent of the promoters of the movement, it is no exaggeration to say that this gift of the National Government has proved to be a magnificent endowment with magnificent results.

In the mean time, while these institutions were attempting by their various methods to work out the problems presented to them in their different localities, under the pressure of a more or less alert public opinion and more or less watchful legislation, the ideas of the scientific world were gradually changing as to the direction in which real and immediate advancement was to be sought. While practical men had accomplished more, probably, than in any similar period of the world's previous history, the chemical, the physical, and the biological laboratory had risen into an altogether new and commanding position. The great advances in the knowledge and applications of chemical, physical, and mechanical science had revolutionized the world of practice and the world of thought. Advancement was probably greatest at first on the mechanical and physical side; but, as a rule, no department of thought or activity is likely to remain long or far in the rear of another, and the conviction rapidly took possession first of the scientific and then of the popular mind that the same methods of close research and exact application which had produced the great advancement in the arts and industries of life, in location, transportation, communication, construction, and in the general utilization of the material world, must be capable of equal application to the investigation of the subtle processes by which nature elaborates her secret resources in order to provide food for mankind. This idea, first applied in the laboratory, soon took form in an institution combining both the researches of the laboratory and its applications in the field, then, and thereafter, known as the investigation station or experiment station. The central idea of the experiment station is to inquire into the operations of nature by the most searching processes and appliances which science can furnish, and, on the other hand, to subject the processes and the inductions of science to the tests which nature, in her free operation, furnishes. Artificial conditions and artificial processes may be and must be resorted to, but only for the sake of investigating, on a small scale, the problems which nature herself must finally and conclusively settle on her own broad scale.

The practicability and fruitfulness of this idea soon made itself manifest and commended itself alike to the scientific and the practical judgment. First taking root in England and Germany, it rapidly spread to other European nations, and was finally transplanted to this country in 1875. It was not unnatural that the stations first established should be independently organized, although they were designed to perform a work which had been already undertaken to some extent, and with varying success, by the existing land-grant colleges. The very dissatisfaction with the latter, as well as the fact demonstrated by experience that their energies and resources were principally employed in other lines, naturally favored such a course. Almost immediately, however, as in the case of Connecticut the pioneer, of North Carolina and of New Jersey, they began to drift into their natural affiliation with the established institutions, and when, in 1887, just ten years after the systematic establishment of the Connecticut Agricultural Experiment Station, the United States Congress enacted the law by which Government aid should be given to every State and Territory, for this purpose, the measure, as we have already seen, was, in form and in fact, a supplement to the act of 1862. It is hardly necessary to submit argument upon this point to a body like that before me, composed of gentlemen who have had an active part either in securing the passage of this measure or in guiding its first applications or both, and who have by force of circumstances been compelled to study the bearing of all its provisions, but this fact deserves to be distinctly noted, because these stations in the several States, and this Association as representing them, are now forming precedents which will be of lasting influence in shaping the attitude and development both of the colleges and the stations, and it is therefore of the greatest importance that the initial steps should be taken from a right starting-point and in a right direction.

My general proposition is that the history of the movement, the language of the law, and the natural fitness of things all combine to bring the colleges and the stations into close and intimate relations, and to make their work mutually helpful and their prosperity mutually dependent. As is well known, no debate upon the measure took place in the House of Representatives while it was pending, or at the time of its final passage. The members of the House had become so fully informed and so thoroughly interested that debate was unnecessary, but the report of the committee, which unanimously adopted and supported the bill, furnishes conclusive testimony as to their united understanding of its aim and purport. I quote briefly from pages 7 and 8 of the report. After speaking of the great and increasing demand for experimental work, the committee say :

It is this situation that the land-grant colleges have tried to meet in the way above indicated. That the results produced, while of the greatest value, have been far from satisfactory to themselves and far from meeting the present requirements of public need, is freely admitted. But it should be borne in mind that experiment work is only an incidental part of their proper vocation. Their leading function is, in the

words of the law of 1862, "to teach branches of learning." If the work of the institutions related exclusively to agriculture, or could be so restricted in honest compliance with the provisions of the law, experiment work would be legitimate so far as it formed a method of teaching, but could scarcely be extended so as to cover the broad field of practical life. But their work can not be restricted to agriculture. Under the law they must also teach "the branches of learning related to the mechanic arts" and are not to exclude "other scientific and classical studies."

What they have done, therefore, in experimenting and publishing for practical, as distinguished from educational, ends, has been done in recognition of a deeply-felt public need, and only by diverting to this use resources which were already inadequate for their strictly educational work.

Congress is now asked to undertake, on the broadest grounds of public policy and of enlightened care for the national well-being, the work so urgently needed, but so imperfectly provided for.

The benefits that would be conferred upon the country by the passage of this bill are immeasurable. They are limited by no State or sectional lines.

The bill proposes to utilize the buildings, laboratories, farms, libraries, and apparatus belonging to the institutions which Congress has already established, and thus to supplement, for a specific end, the appliances already created for general ends. The provisions made for conducting the work, with careful restrictions upon waste of funds, the methods provided for collating and publishing results, and for coöperation among the stations, all tend to give the proposed operations a character of breadth, permanence, and general usefulness which could not so well (if at all) be secured in any other way.

It should be observed also that this bill is not open to the objection of entering upon any new or untried field of Congressional legislation. It only proposes to give a practical direction to agencies which Congress has already created.

The act appropriating scrip to the amount of 30,000 acres for each Senator and Representative in Congress for the endowment of colleges for the benefit of agriculture and the mechanic arts, which was passed in 1862, has been fruitful. Some of the States endowed single colleges while others divided the gift between two or three. There were 17,430,000 acres of scrip and land granted, and the fund arising from their sales is \$7,545,405. This has been increased by gifts from the States and from benevolent individuals of grounds, buildings, and apparatus to the amount of \$5,000,000 more. And the last reports show that these colleges employed more than 400 professors, and had under instruction more than 4,000 students. This donation of the public funds has been eminently profitable for the Government and the country. Many thousands of young men educated in science have already gone out from their colleges to engage in the practical duties of life, and the provision is made for sending out a continued succession of these for all future time. And as science is not limited by State boundaries, it makes but little difference for the common good which of these institutions or States these graduates come from; their attainments are for the common good. The bill under consideration proposes to increase the efficiency of these colleges in their relations to agriculture exclusively.

In the Senate the matter was quite fully discussed on two or three different occasions, and a reference to these debates will confirm the statement that there was in the minds of Senators when modifying the bill and voting for its passage no other thought than that the stations they were establishing should be identified with teaching institutions, either those already established or such as might, in exceptional cases, be subsequently established by State legislation. The design was, while leaving the established colleges to pursue their function of teaching, as already carried on, and making no suggestions looking to a modi-

fication of that, to provide for *these same institutions* additional resources in order that the men already employed or other men yet to be employed might devote themselves specially to the lines of research, investigation, and experiment, which had proved so promising and fruitful elsewhere.

I quote upon this point a single statement from the Senator whose words, in another connection, have been already cited. Senator Morrill, in the course of the debate, said :

So I do not think that we are erring in giving these institutions [*i. e.*, the colleges] a little more help. I know that more than half of them absolutely need this help in order to go on with the work that is proposed, and no one will question but that the work proposed in these agricultural experiment stations is useful, because farmers of twenty-one years of age up to fifty and sixty come there to seek instruction.

In the great majority of cases this anticipation of the law has been fulfilled, and so far I believe in the main, with excellent results. The colleges had already accumulated lands, buildings, libraries, apparatus, and similar necessary equipment, and especially, they had brought together and trained almost the only body of men who could be summoned to the new service of research. A separation of the two under such circumstances, even if it had been possible, would have been for many years extremely injurious to the best interests of both, and I may be allowed to express the hope that no narrowness of view, no petty jealousies springing merely from a diversity of pursuits which have a common aim, no failure to see that in a large and generous sense all these men and agencies and interests are identical, will ever come in to prevent the cordial, harmonious, and unselfish co-operation of each with the other.

There is another view of this relation which should be specially emphasized. The mutually stimulating relations of teaching and investigation have often been dwelt upon by those who have been practically engaged in the two directions, as well as by all who have made a study of the philosophy of education. There is no true teacher who has not felt the increased sense of confidence and power with his pupils which has come from original and independent study of the branches which he was teaching. On the other hand, no man engaged in research has ever failed to find his own intellectual processes quickened, his views of truth or of fact widened and rectified, his whole horizon broadened and defined by bringing the best results of his investigation to the test of young, ambitious, and alert beginners in the same pathway. The experiment stations can receive no greater benefit than to enlist as far as possible in their services men who are engaged in the direct work of teaching. On the other hand, the colleges could do themselves no greater injury than to withhold their active teachers from participation in the work of research and experiment in the stations. This view, I believe, would be amply confirmed by a larger investigation than I have been able to make of the history of scientific advancement. The great

names, the names of those who have contributed largely and specifically to the intellectual wealth of the world, have for the most part been teachers; not always, to be sure, those who were confined to the daily drudgery of routine tasks, but those who felt themselves called to find, and to apply, and to communicate to others, new truth; those whose minds were thus brought into vitalizing contact with other minds. The desire to communicate to others, to instruct, to help, is the truest source of inspiration in all fruitful research. This is true whether applied strictly to academic teaching or to the more general and popular form of lecture and address.

In Germany, for example, the home of modern scientific research, the parent and promoter of that research has been the university. There the teacher has been the investigator, and the investigator has been the teacher; and the belief that this broad fact has some appreciative causative connection with her immense advances in every field of science may at least give us food for serious reflection.

It is the good fortune of our experiment stations that they are compelled by law to bring their results frequently to the test of public examination, and the influence of this will be largely felt, not only by the stations themselves, but by the colleges with which they are connected.

Thus may it ever be. Let the college investigate that it may teach well, and the station teach that it may investigate, and this two-fold cord shall not easily be broken. (Applause.)

And now, gentlemen of this Association, I can not let this occasion pass without turning aside to pay a brief tribute to one whose feet since our last meeting have touched the other shore of the dark river.

I have not ventured to put into writing what I wish to say, nor do I feel that this is the time or place to indulge in eulogy of our late associate, Dr. George H. Cook, of New Jersey. But I feel that it is due to his memory and to us, as his surviving friends, to say a brief word in order to show that, as we pass on in the journey of life, we do not forget those who have labored successfully and faithfully, with us and for us.

Dr. Cook had a rare and happy experience in his days of training, being brought early into contact with youth, becoming thus a living exemplification of the thesis I have endeavored to maintain, that the practical work of science on the one hand, and the preparation for duty in the class-room upon the other, have a mutually stimulating and beneficial effect.

He was all his life a teacher, to the last days of his life, and his public record is that of a man engaged in the application of science. In the Troy Polytechnic Institute, and later for the last thirty years and more in Rutgers College, his work has been almost daily and nightly connected with the class-room.

This Association owes to him a debt of immeasurable gratitude. He early came to the sound conviction that any average legislative body, if made to see that money would be wisely expended for public ends,

and judiciously and honestly accounted for, could be brought to support any public enterprise, however far removed it might seem to be from the ordinary daily apprehension of men. And Dr. Cook lived to see his geological reports, annually issued by the State printer, more eagerly sought for by the legislature and its constituents than any other public document published by the State. He lived to see every measure of his work carried to a successful completion by his State. His map of New Jersey he was fortunate enough to see practically completed. It served as a model in completeness of detail, in perfection of method, and in large and broad results, for similar work in every State in the Union. His final report on the survey of the State is not completed, but so far advanced that the first volume has already been issued, and the other is well on the way.

He was a man of infinite patience. If he was not able to persuade the legislature this year that all he wanted was desirable, if he was not able to educate the members up to the breadth of his own conception, he took what they would give, assured that the results therefrom would enlarge and liberalize their hearts.

From personal observation during many years of association with him, in which our views did not always agree, I can say that no man in the State of New Jersey had more influence with the legislature, with public men, and with people, than George H. Cook, living his simple, unostentatious, but powerful life. I look back upon my associations with him with the greatest gratitude for some of the lessons of life learned from him.

Coming from our last meeting at Knoxville he told me, with great gratification, that he had just seen completed, after having run through a long course of legislation and of litigation in the courts, the work of taking charge of the drainage of the State under State law, and had seen the work applied to a valuable piece of property which his grandfather had years before begun to drain. I have taken that always as typical of the character of his methods, as evidence of the infinite patience, the untiring patience, the persistence that would not be diverted. If he found an obstacle he was unable to overcome he turned to another path, always keeping the one aim before him.

I am not sure that the motto, "*De mortuis nil nisi bonum*," is always a wise one. We can not say that it is never wise to consider the defects of method in a man's work. It must be recognized that a man who could accomplish so much necessarily made enemies. Perhaps he did. Perhaps men ought to have differed from him. I think I myself was right in differing with him in regard to some of his views. But in all his career, it may be placed on record without any qualification or reserve, he kept in view the public good, maintaining the highest standard of personal and public rectitude. No farthing of public money or public trust was ever misused in his hands.

I have said, gentlemen, that we owe to him a great debt because of

those very characteristics, for those characteristics impelled him to form this Association, led to the passage of the law under which we are organized.

Those were the characteristics which led him with unflinching and undying tenacity of purpose, without any confidential counsel, and when it seemed as if all the world was against the movement.

He was a true man. He was a Christian. He kept his faith in God and in the eternal verities untarnished. He kept his faith in his fellow-men untarnished. He lived to do good; and his family and friends now not only take guidance from his example but feel thankful that such a life has existed.

Mr. JORDAÑ. As one of the younger workers in agricultural science, who have sat at the feet of Dr. Cook and learned of him, I desire to move the passage of the following resolution :

Resolved, That this Association, mindful of the great loss it has sustained in the death of George H. Cook, of New Jersey, desires to place on record its grateful recognition of his distinguished services to the cause of science and to this Association and its high appreciation of his integrity, purity, and nobleness of character.

The PRESIDING OFFICER. We will vote by rising.

All the delegates rose.

The PRESIDING OFFICER. Next in order are informal addresses by the vice-presidents. The Chair calls upon President McInnis, of Texas.

Mr. MCINNIS. I feel that to say anything after the address made by our president would be superfluous. I can say only that I heartily endorse the sentiments he has expressed this evening, and I think that all the members of the Association should feel thankful to him for the clear presentation he has made of the relations between agricultural colleges and experiment stations.

In my opinion, the practical relation between the agricultural experiment stations and the colleges is that the stations are to occupy a co-ordinate position with the college departments having instruction for their purpose. Their purpose is investigation, but the final use of investigation is instruction; not necessarily the instruction of youth, but the instruction of all studious and teachable minds.

At the request of Vice-President Murfee, President Atherton resumed the chair, and Mr. Murfee took his place on the floor.

Mr. MURFEE. I wish to express the interest that I, as a member of the Association, have in the Association. "I feel it a great honor to be connected with the gentlemen who constitute this body. I feel it a great honor to have been selected by you as a vice-president of this Association; but, as I remarked to a friend of mine to-day, while I feel honored even to be thought of by you, I have suspected that you elected me simply to do the ornamental part. [Laughter.] My friend told me I could not fill that position, so now I feel quite out of place. [Laughter.]

And yet we all have real work to do in this Association. That work has been stated elaborately and beautifully by our president. I think we shall all go back to our posts of duty, feeling that we have a grand

object to accomplish. Many of you think so now. The president's address is in keeping with the larger views of education. The connection of the agricultural colleges and the experiment stations is sometimes discussed as though it were simply a matter of digging potatoes or hoeing corn. I am glad that view is not dominant here. Wherever in our States it is found, let us put it down. I should be glad to have a sufficient number of copies of President Atherton's speech to distribute one to each member of our legislature. I do not desire to reflect upon the members of our legislature, which has from year to year allowed us funds which has enabled us to do good work; but if they would all read that speech, they would take a higher view of the work of our college and station.

We are fortunate in living in a century of progress. We are fortunate, as our president has just said, in living in a country where education is appreciated. The first president of our country said, as you all remember, that the salvation of the country was the education of the masses. His followers have carried out his idea. We have a grand work to accomplish, and each State ought to be proud of its opportunity. We not only live in a good century and in a good country, but we have facilities which can be put to great uses. Let us use our facilities and opportunities so as to show our people that we mean business.

There is, as I was about to say, a principle running through all our work. You remember the great Agassiz and his methods of investigation. He was not satisfied with the *a priori* reasoning of others, but was an original investigator, using what he could gain by books, and then going beyond the books. We are engaged in the same kind of work. Each one of us has two eyes and two hands with which to work, and by means of the benefits we obtain through this Association, we ought to accomplish much for the country. We are deployed, as it were, from the east to the west, and from the north to the south. We view the whole country.

Let not the idea obtain that this is an association for investigation solely and the idea of mental training for youth be forgotten. Let it be borne in mind that the primary object of all our work, is the training of the youth of the country, the men of the future. The investigations made by the experiment stations is largely for the eyes of the college students. They see the methods pursued; their hands are trained; their eyes are trained; all their senses are trained; their powers of perception are trained; their judgment is matured; they are inspired by seeing the results; they are made better by communion with nature, and through nature their thoughts are lifted to their Creator. And altogether our work, though it may be in connection with machine shops and other earthly matters, is and should be calculated to lift the thoughts of our boys to their God.

Mr. ALVORD. I move that we adjourn.

The motion was agreed to; and accordingly at 8.17 p. m. the Association adjourned.

THIRD DAY.

MORNING SESSION, THURSDAY, NOVEMBER 14, 1889.

The Association was called to order at 9.43 a. m.

The PRESIDENT. First in order is the report of the committee on the order of business.

Mr. ALVORD. The committee desires to make no change in the programme for to-day, as printed, except to propose that the discussion on the primary obligations of colleges and stations under the Hatch act, which should have taken place on Tuesday, be set down for 11.30, or as near that time as possible. Gentlemen have kindly consented to open the discussion in place of those who had been previously asked to do so.

The visit to the White House, on the programme for noon to-day, will be indefinitely postponed, as the President of the United States is out of the city.

The executive committee has various resolutions under consideration, preparing to report them this afternoon, which, as will be noted, is the business session of the convention. Therefore any resolutions needing to be considered by the committee, should be forthcoming before the close of the discussion this morning.

In the question box the committee found two questions which should be propounded to the Association, and will take the first opportunity of reading them. The other questions ought to go to the conference of station men.

The executive committee will assemble upon adjournment at 12.30.

The PRESIDENT. Unless there is objection, the report of the committee on the order of business will be accepted as the order of the day.

Mr. MYERS. In order to facilitate business I move that a committee of seven, upon nominations for office, be appointed by the chair, to report at the afternoon session.

The motion was agreed to.

Mr. JENKINS. A committee of experiment station workers, of which Professor Stockbridge is chairman, desires to present to the convention the following resolutions for adoption.

The resolutions were read by the secretary :

Resolved, That this convention recommends that the methods approved by the Association of Official Agricultural Chemists be strictly followed by all agricultural colleges and experiment stations which do analytical work; but that if, for any reason it seems necessary to the chemist to change or modify the methods in a particular case, the change be distinctly noted in the published record.

Resolved, That the permanent committee on chemistry be requested to formulate and report to all concerned a system for uniformity in the expression and record of the results of analytical work at colleges and stations.

The PRESIDENT. The resolution will be referred to the executive committee and come up for consideration this afternoon in the regular order of business.

Is there any other miscellaneous business?

Mr. MORROW. The report of a committee appointed night before last has been prepared, and if proper, I will now present it:

The committee to which was referred the matter of the character and extent of the annual reports of the institutions established under the act of July 2, 1862, would respectfully report:

The importance of the preparation of these reports annually, and, whenever it is practicable, their prompt publication and distribution in accordance with the provisions of the law is earnestly recommended. In view of the value of the reports to officers of the colleges it is recommended that two copies be sent to each institution entitled to receive them.

While the exact form and extent of the report must be left to the judgment of the officers of each institution, it is believed it should clearly show the scope and extent of the work of instruction in the institution, the extent and nature of the facilities possessed by it, and especially, the nature of any changes or improvements made.

While the detailed reports of experiments may be made in the special publications of the experiment station, at least the nature and extent of the experimental work done should be stated in the reports in question.

The extent to which statistics or "other matter" shall be included, must be left to the judgment of the officers of each institution, as influenced by the funds available for securing the information and the extent to which other officers or organizations in the State are charged with the duty of publishing information of like character.

For the committee.

G. E. MORROW.

The PRESIDENT. That report will be received and come up for further action at the afternoon session. (See page 102.) Is there any further miscellaneous business?

Mr. McINNIS. At the request of several members of the Association I wish to renew the resolution I introduced yesterday, which was withdrawn under a misapprehension, both on my part and on the part of Dr. Atwater. It now provides that the Secretary of Agriculture be requested by the executive committee to prepare a college directory. I will read it as it is now worded:

Resolved, That the executive committee of this Association request the honorable Secretary of Agriculture to have prepared annually, as a "circular of information," a directory of the colleges established under the provisions of the "land grant act" of 1862, similar to the directory of experiment stations already published.

The PRESIDENT. Does the convention understand the motion? A resolution like the one just read was offered yesterday, but was withdrawn under a misapprehension.

The resolution was adopted.

The PRESIDENT. Is there any other miscellaneous business? If not, we will pass to the discussion of the first topic on the programme,

"The horticultural work of the experiment stations." The discussion will be opened by Mr. Alwood.

Mr. ALWOOD. As one hour of the time allotted to this session has already passed, we think best to announce that the horticulturists in their committee meetings have discussed the matters of most immediate importance to them in their work, and that they do not care this morning for a general discussion of horticultural work unless the members of the convention desire it. We will confine ourselves to a statement of the work of the committee on horticulture during the past year and to the reading of certain recommendations. I will read a short paper prepared by the committee on horticulture.

THE WORK OF THE COMMITTEE ON CO-OPERATIVE WORK IN HORTICULTURE.

This committee had its origin in a paper presented by the horticulturists at our last annual convention, held at Knoxville, Tenn. The purpose of that paper was to secure such voluntary co-operation between the horticultural workers as would aid and supplement the work of individual stations by securing unity of action on matters of general importance.

The objects had in view by those who drew up the paper mentioned were (1) to take steps to bring the horticulturists into closer relations with those who originate and disseminate new varieties of fruits and vegetables, to the end that they might secure new products and test them before put upon the market; (2) to prepare data in the way of lists, etc., which would put all of the stations in possession of equal facilities for entering upon such part of this work as they might see fit; (3) to secure in a measure uniformity of methods in reporting, so that the work of the several stations might be easily compared.

The committee, after consultation, decided to issue a circular letter to the stations calling for the information necessary to enable them to compile a list of originators with the specialties of each.

Through the courtesy of Dr. Atwater, a circular letter, accompanied by a copy of the paper showing the authority of the committee, was issued February 6, 1889, by the Office of Experiment Stations. To this letter about one-third of the stations responded, and the committee compiled the list published by the Office of Experiment Stations March 8, as Document No. 7.

This list contains some two hundred names and addresses, comprising many of the best specialists in horticulture and pomology in the United States. It could scarcely be expected that a complete list could be compiled in the short space of six weeks; but yet it is believed that this imperfect one has materially aided the special workers, and forms the basis of what ought to become, with future revisions, a very important help in securing new varieties.

The next matter which engaged the attention of the committee was

the preparation of forms for reporting to originators, for use in exchanges among workers, and for use in compiling special bulletins for publication by the U. S. Department of Agriculture. In this matter we endeavored to meet the wishes of every person who submitted any data. As a result we produced a form which in a measure combined note taking and reporting. It was decided that this was too cumbersome and trespassed upon the individuality of the workers, and we therefore issued a simpler form, in which we attempted to give place only to those points of practical and scientific importance on which there could not well be a difference of opinion. The forms issued by the committee are Documents Nos. 11, 12, and 13 of the Office of Experiment Stations, and have, with slight criticism, met the general wishes of the workers. There can be no question that with the development of the co-operative work some such forms as these will prove a necessity. We hope that the work in this direction may be extended by a future committee, and that records and note taking may be brought to some common plan.

The committee made an effort during the early part of the year to secure statements from the stations concerning their work in horticulture, but were not entirely successful, as the reports came in slowly, and in some cases were of too vague a character to furnish data for compilation. Finally, at the suggestion of several leading men in this line of work, it was decided to call a convention of station horticulturists for conference. This meeting was held at Columbus, Ohio, June 13-14 last; seven States and the United States Department of Agriculture were represented, and the staff of the Ohio Experiment Station, and some of the faculty of the university were present. The results of this conference were of greater value than the committee had anticipated, and gave a new impetus to its work. It also led to the beginning of a new work which has already borne fruit. Of this I will speak presently.

The convention, with a few suggestions as to changes, fully indorsed the work of the committee, and entered into its plans for the future, furnishing advice and assistance, which have made better results possible. A brief report of the meeting was made by the Office of Experiment Stations, and by the secretary of the meeting, and printed as Experiment Station Bulletin No. 3. This has been sent to all the workers, and many others besides. The discussions of this meeting were quite full and satisfactory, and we regret that a more full report was not made.

At the convention, a sub-committee on the nomenclature of vegetables was appointed. This committee has already begun a good work as is shown by the report on rules and nomenclature recently issued through the Office of Experiment Stations. It is entirely foreign to our purpose to enter into discussion in this paper, but we can not forbear suggesting that future work along the line pointed out by this committee will be of real practical and scientific importance. Some recommendations concerning future work will follow.

In accordance with the views of the horticulturists, as expressed at the meeting just mentioned, the committee formulated and sent out a set of questions concerning the special lines of horticultural work in the various stations which it hoped would elicit information of such a nature that it could be put into shape for a bulletin of reference. To this circular of inquiry nearly all the stations responded. Some few needed considerable urging, but the work has finally been completed and a bulletin is now in press. When issued it will complete the work contemplated by the present committee.

The publications emanating from this committee including circulars, forms, and bulletins, are ten in number, and we believe the committee has succeeded reasonably well in its work. The work is just begun and its fruits are to be seen in the future. Already the committee's work has aided in the organization of the department of horticulture in the experiment stations, and if followed up, will very materially improve the standing and the value of the investigations of this department.

About to lay down our work, we beg leave to make the following recommendations :

First. That there be created a standing committee on horticulture, which shall replace the present committee and assume the duties of the subcommittee on nomenclature.

Second. That the committee be composed of five members and have power to appoint subcommittees of one or more members for special purposes.

Third. That the members of the committee be appointed for one year, and that it elect its own chairman.

Fourth. That the committee have power to publish, with the advice and through the Office of Experiment Stations, such lists, forms, etc., as may seem needed to further the work in horticulture.

Fifth. That the committee be charged with the immediate preparation and publication of a standard list on the nomenclature of vegetables, to be submitted to all of the stations for suggestions, and, after final revision by the committee, to be adopted by the stations and used exclusively in their publications.

Sixth. That the committee be authorized to work in conjunction with the Division of Pomology of the United States Department of Agriculture, in completing and revising the list of cultivated fruits of North America, upon which that division is now working ; and that this list, when completed, be adopted as an authority to be followed in all station publications.

Seventh. That the committee be charged with the preparation of special bulletins giving the results of trials of new varieties at the several stations.

In conclusion, it gives the committee pleasure to say that Director Atwater and Assistant Director Harris, of the Office of Experiment Stations, have extended to us every courtesy in their power, and that

to their intelligent efforts to further our work is largely due whatever successes we may have attained.

The recommendations the committee respectfully present for adoption by the Association.

The PRESIDENT. The next speaker on the programme, Mr. Bailey, of New York, is not present. Mr. Tracy follows him on the programme.

Mr. TRACY. As already stated by Mr. Alwood, the time for this discussion may be used to better advantage in the discussion of subjects of greater general interest. The horticultural work of the stations must be almost wholly local. The problems with which we have to deal in the far south are so different from those of the northern sections, and they are so different from those of the far west, that to a great extent each station must be left to work out its own salvation.

In the recommendations made by the committee there are some points which I am confident will receive the very hearty approval of the entire Association. One which is of great importance refers to a uniform method of making reports. One important duty of the horticulturists will be the testing of the adaptability of the new varieties sent out every year by the nurserymen. It is now difficult to compare a report of the value of any particular variety in Mississippi or Florida with one written by a Maine or Minnesota horticulturist. Reports must be made upon a definite and uniform plan in order to make them of value for comparison.

One point which I think should receive very close attention from all the stations is the production by selection or by crossing of varieties especially adapted to particular localities. It is a generally accepted theory among botanists and horticulturists that the character of the future plant is affected by the environment of the parent plant while the seed is being developed and matured; that is, that a seedling from an apple grown in the climate of Louisiana will be decided partly by the peculiar conditions under which the particular apple containing that seed was grown—that to a certain extent climate and soil will vary its character. For that reason we must pay more attention to the selection of good seeds from which to produce new varieties. I think it would be of very little use to send to the north and west to purchase seed from which to develop new varieties for the south. We must not only grow the plants ourselves, but we must raise the seeds ourselves.

The PRESIDENT. The next name on the programme is that of Professor Taft, of Michigan. The Chair understands he is not present. The subject is now open for discussion by the Association. (After a pause.) There seems to be no desire to discuss the subject further. The Chair will submit the question in regard to the paper presented by Mr. Alwood.

Mr. MYERS. I move that the report presented by Mr. Alwood, together with its recommendations, be referred to the executive committee.

The motion was agreed to.

The PRESIDENT. The next topic for discussion is : "What should be the relation between colleges and experiment stations and agricultural exhibitions, institutes, and other public meetings?"

Mr. WILLITS. I find in my observation and experience that there are two opinions on this subject. I find a strong tendency among the workers, in both the colleges and the experiment stations, towards the idea that they are to do their work there; that their duties are in the class-room or in the laboratory; and that good work can not be done in either if they are diverted into what we call the public service. I find, therefore, that when the professor who is the chief of a department desires assistance, he is apt to select as an assistant a man who shall do simply perfunctory duties, one who is a handy assistant, who can mix chemicals, who can arrange insects, who can relieve his chief of detail. The result is that the young man is educated in laboratory work, but does not in any way get before the public and become fitted for public speaking. Those who take this course say that the kind of work described has to be done, and that in order to accomplish the best results the assistant should not be diverted by public services.

I have in my mind a college which has a pay-roll containing eighty professors. And in the whole list there are but one or two who could be called upon in any public emergency.

I believe that every institution of learning should, in a sense, be an apostle in the community where it is located. I speak more particularly of our western colleges, for, as I understand, the eastern colleges are already centers of influence felt outside of their college walls.

The tendency has been too much to house the professors and instructors. I believe that they should go to the people in their territory, not only by means of bulletins and the press, but in person and by voice. I will go as far as any in lauding the power of the press. But I care not how fertile a man may be in resources, or how rich in intellectual faculties, he can not infuse into writing the personality which he takes into an audience or into a community when he comes before them personally.

The agricultural college must win its own way into public confidence. I recollect that when I was first considering the question of accepting a position in the Michigan Agricultural College and consulted a friend about it, he said, "It is strange that you should have been selected to attempt the solution of one of the most difficult educational problems—you who have had no discipline in agricultural education." I said to him, "It is possible that I may be better fitted for the reason that I am not in any rut." Educators are likely to get into ruts, and perhaps the deepest of the ruts is that which keeps them forever on the college campus. He said, "It is doubted whether there is in the educational affairs of this country any place for the agricultural college." I said, "I believe there is a place and that the agricultural college is winning its way." He said, "It must win its way." You know the advantages of the old colleges, founded years ago and possessing an air of dignity, a

sort of aroma of age and learning, that leads the sons to wish to graduate where their fathers and grandfathers graduated. The son expects to go to the father's college. The agricultural college is new and must win its position by hard work. In my opinion, it can do so in two ways; first by good work in the class-room and in the laboratory, and, second, by good work in public services. Every college should have some men able to tell in public what they know.

The fact that one is an instructor in a college does not, in my judgment, prevent efficient work in the laboratory. I most emphatically approve of the idea presented in the very admirable address of last night, that the best scientific work the world has ever had has been done by men who had classes to instruct. I go further and say that the scientific man will not belittle either himself or his work if he steps from the laboratory or class room out before the great community with which he is associated. I practiced law early in my life. I studied with one of the most eminent jurists of the country, one who finally sat on the supreme bench of the State of Michigan. I occupied his office and in a measure took his business after he went upon the bench. He had a private office in the city, where he wrote the opinions he delivered from the bench. He would occasionally get into a snarl, and would come to my office and state a proposition which we would discuss. Invariably a half hour's discussion with me, who knew not one-quarter as much as he did, would clear the whole subject. Talking a subject over, discussing it, makes it clearer.

The same statement applies to the work of the college professor. I think there is a great deal of nonsense—now I am going to speak perhaps not quite according to the book—I think there is a great deal of nonsense uttered about shooting over the heads of the people. I think there is nothing so—I will not say disgusting—so unpleasant to me as to hear a strong man, one of ability, addressing an audience of children and using baby talk. It is the most arrant nonsense. I tell you children catch ideas better than we think. So let us not discredit the intelligence of farmers. I do not say they can follow technical and classical terms. Translate them. But I tell you the average audience in the United States and the average reader in the United States can comprehend more than one would suppose after hearing all the talk about shooting over the farmer's head. The fact is, the average farmer likes to hear something a little above his ordinary comprehension. You should cater to the intelligence, not to the ignorance of the people.

In addressing an audience be lucid and state your propositions clearly, and you will ordinarily find that the audience can comprehend you. But for success in public speaking a great deal depends upon beginning with men young. Start them out right. Give the young men a chance. Let them do some work for themselves. When the college professor is away put the young man in the class-room and let him lecture in the professor's place. If he understands his subject he will take pride in

his work and do it well. Thus you can raise in your colleges—and that is what I am after—a corps of young men who will be able to go out in public and talk to some advantage.

The course I advocate will interfere somewhat with college work. But I used to say to my professors, "When you go outside you receive more than you give." You get into harmony with the people and learn what they want.

I believe the agricultural college has won its way. It already has a place in the education of the country. As our president said last night in his annual address, it has had much to do with the great movement which has caused the classical institutions of the country to bend before the great impulse for scientific training of which it is the leading representative. Three years ago I went to Princeton and spent three days there in studying college methods. I wanted to meet that grand old man, Dr. McCosh. I supposed he was so wedded to his mental philosophy and his classics that I would have to discuss the old question, "has the agricultural college a place in the educational system of the United States." How gratified was I to find him in hearty sympathy with the new impulse, and to see how Princeton had modified her courses of study so as to include science, and to inspect her magnificent laboratories. The best minds of the country are in sympathy with you. You have won the consideration of the country. All you need to do is to be prudent, careful, and wise, to gain the ear of the farmer, to talk of things about which he wants information, of things he wants to understand.

The PRESIDENT. The next speaker is Professor Menke.

Mr. MENKE. The relation of experiment stations to stock associations and other public institutions is a matter to which, in the southwest, we pay considerable attention. We believe our officers should be as closely related to the farmers as possible.

In Arkansas we have a large grange with a membership of about 60,000, and two stock associations with smaller numbers. To reach these stock associations is not easy. One of them has built a large hall at our branch experiment station at Newport, where they hold their meetings every two months, and where they meet officers of our station. Our veterinarian goes more frequently than any other person. He leads discussions and goes further. We are interested in spaying. He occasionally performs that operation in one or more ways in the presence of the association. So much interest is taken in his work that he is frequently kept for a week. The members take him home with them, and will not let him spend a cent of money while he stays.

We have a branch station at Pine Bluff. Of course we have only a small amount of money to expend on it and need aid. Not long ago I wrote about this need to some of the leading planters and business men of the locality. I wish to emphasize the fact that I wrote to some of the business men, for without them we can do nothing. In response they

wrote me to come down and give them a business talk, not a speech. I went. I found that this circular had been printed and distributed. The verbiage is southwestern, and may amuse you. I know it will fall broadly on the ear of Professor Henry :

ATTENTION FARMERS, MERCHANTS, BUSINESS MEN,

AND

All interested in the welfare and farming interests
of Jefferson County.

*Knox's Hall, 7.30 p. m., to-day, Tuesday, November 5,
1889.*

Col. M. F. Locke,
State Com. Agriculture

Prof. A. E. Menke,
of the Ark. Ind. U.,

And others, will talk to the people of the necessity of maintaining an experiment station at Pine Bluff, Ark. Don't fail to be present. This is a matter of more than passing importance, and we earnestly request every one who reads this to come out. The cause is a good one. Hump yourself this time and be on hand.

[Laughter.]

Then follow the signatures of twenty of the leading business men and farmers of the section. I found a gathering of about 120 men, talked to them of what we wanted, and asked them for \$2,000. They said, "We appreciate what you have been doing, and \$2,000 is not enough; we will give you \$5,000;" and last Tuesday week I got \$5,000 from them. And more; they promised any additional aid we might need. I made it a point to talk about that we had done and not to say much about what we promised to do. That don't pay in the southwest. [Laughter.]

The grange is difficult to work with. It is a secret organization, and unless you join it you can't get into its meetings. We circumvent this difficulty in this way. We prepare on large sheets, as concisely as possible, statements of the results of our experiments on fertilizers for cotton, or on different varieties of cotton, illustrating comparative yields and the profit or loss in the use of the different fertilizers. We put these sheets in the grange halls. From the grange halls they go to different court-houses and are hung on the walls, and when the people in attendance at court get tired of listening to the lawyers they rest their eyes on the sheets. They are not only restful, but educational also.

The PRESIDENT. The discussion will be continued by Professor Myers.

Mr. MYERS. The topic divides itself into two parts:

First. What should be the relation of the experiment stations to agricultural exhibitions?

Second. What should be the relation of experiment stations to farmers' institutes and other public meetings?

Discussing these in the order in which they are presented, we inquire, first, what should be the relation of agricultural experiment stations to exhibitions?

That question will force itself upon the attention of our authorities sooner or later, and it is particularly fortunate, I think, that it is to be discussed at this meeting. There is no provision in the law establishing the agricultural experiment stations authorizing the spending of money upon a State fair or upon a State exposition unless authority be found under the head of distributing information to farmers. It has been understood in some of the States, and I believe it is an entirely proper interpretation of the law, that the distribution of the results of investigation may be largely left to the controlling boards of the stations. The law requires that each station shall make at least one publication every three months and issue an annual report. It places, however, no bar upon giving information to the farmers in other ways, and it certainly was the intention of the law that information having a practical bearing upon agriculture should be distributed generously and freely. Under this interpretation the station officers of several of the States have made it a point to attend the State fairs or expositions and call the attention of the farmers to their work by making exhibits. This course has been attended with great success.

Perhaps nothing has done more to bring the work of the Agricultural Experiment Station of Wisconsin to the attention of the agricultural public than the exhibit made at the Chicago Fat Stock Shows, to show the effect of scientific feeding upon stock. The director even went so far as to take the exhibit into another State. Last year and this year again the West Virginia Station exhibited with splendid effect a full working creamery at the State fair. The Maryland Station and a number of others have construed the law similarly.

In regard to the second question, I think there can be but one opinion. In farmers' institutes I think the stations should take a very active part. Let the stations organize farmers' institutes in the States where they are not already organized. The institute work is a practical work. It requires the greatest tact, the best training, the readiest wit, and the most profound thought the stations can furnish. It has its effect at once. It tends to build up agriculture, it awakens thought, and stimulates the farmers to new endeavors. In my judgment it is one of the levers the station must use and use earnestly in order to elevate the agriculture of the country.

In conclusion, I think the relation of the agricultural colleges to the experiment stations should be one of the most intimate character. The staffs of the two organizations should be distinct, but upon the most friendly terms.

In looking over the work of the stations I feel sure that United States money has never been expended so loyally and carefully in the exact use for which it was appropriated as has the money given for agricultural education. Let us then do everything in our power to advance

and elevate the cause in which we are engaged, to mold public opinion in favor of higher education, in favor of more careful work, in favor of larger profits and less labor, in favor of more brain labor and less physical work upon the farm. Let the farmer rise to the dignity of a gentleman and not be always trotting behind the car of progress. [Applause.]

The PRESIDENT. The Chair would ask leave to interrupt the consideration of this subject for a few minutes. There is with us, but obliged to leave in a very short time, a gentleman whose name as identified with one branch of industrial and philanthropic education is known everywhere. He has kindly consented to speak to the Association for a few minutes. I have pleasure in presenting to the Association Captain Pratt, of the Indian School at Carlisle, Pa.

Mr. PRATT. I am president of an agricultural college, and as I look about me I see I am surrounded by my pupils (alluding to the numerous pictures of Indians on the walls of the room); I may say that we are now looking upon the first agriculturists of the United States. These Pueblo villagers whose pictures you see before you are agricultural Indians, and have always been the foremost agriculturists of their race.

The Government has at Carlisle a large Indian and agricultural school. We have about 300 acres of land under our care. We have 670 Indian students, largely from what we call the worst tribes, the most obdurate—Apaches, Sioux, Comanches, Kiowas, and Cheyennes. For ten years the Government has been endeavoring to bring them into its household—not into the outer courts, but clear inside, and I may say that its efforts have met with marked success. During the past year we have sent a considerable number of students out as help among the farmers of Pennsylvania, some 350 boys and girls; nearly 100 of them Apaches, over 70 of them very ugly Indians from the Florida and Alabama everglades; and we have found that the Indian is not the lazy good-for-nothing fellow our school histories and his general reputation make him. He is industrious. I have from farmers applications for students far more than I can satisfy. I could easily have placed last year 500 boys and girls. They receive wages, getting whatever they are worth. A boy of twelve to fourteen may get \$4 or \$5 a month; one of sixteen to eighteen, \$8 to \$10 a month; and the boy of twenty, who has had considerable experience, may get from \$10 to \$15 a month. Their earnings last year amounted in the aggregate to over \$12,000. [Applause.]

The PRESIDENT. The Chair is sure he may express the gratification of the Association and extend to Captain Pratt its thanks for the words he has given us.

The next name on the programme is that of Mr. Whitcher.

Mr. WHITCHER. As I look at this subject, we have two things to consider:

(1) Shall the agricultural experiment stations exhibit themselves or

make exhibits of their products, their animals, or their men at agricultural fairs ?

(2) Shall they do institute work ?

I want to go right at this matter in a practical way. I want to find out what I can do to advantage in my State. That may not be the best thing for others; but I am here to find out how to benefit the farmers of my State. I hold views different from those of the speakers who preceded me, and perhaps that is unfortunate for me.

I do not believe in making exhibits at fairs. I ought to give a reason for the faith that is in me, and I will do so. What objects have men in making exhibits ? First, the object of an exhibitor is to compete with others for prizes, to beat some one else. I do not believe we can afford to compete with our farmers. We have enough trouble with them when we go into the local markets to sell the articles we produce. We should not give them the chance to say "Oh, yes, you ought to beat us; you have the whole United States to back you." I have heard that said.

Another object is advertisement. Must we advertise ourselves ? There are ways in which I believe in doing so, but there are other ways in which I do not believe. Dairy work is our chief study. We have dairy animals. If we go into the show ring, our animals must be prepared in ways which those who exhibit in show rings understand. But these preparations interfere with experimental work. An animal well fitted for the show ring is not well fitted for the experiment station. Consequently, I think we can not exhibit animals.

Another thing. We have two State agricultural fair associations. If we exhibit at one, we must at the other. Then we have local associations, and they will be offended if we don't exhibit with them. Where shall we draw the line ? I have drawn the line at no exhibits at all.

In regard to institute work, let me say that no one appreciates more fully the importance of that work than I do, but there are some difficulties connected with it I would like to have cleared away. In some States institute boards or boards of agriculture have charge of the institute work. The question I want settled is this: Is it best in such States for the agricultural experiment stations in connection with the colleges to organize institutes of their own ? If we do so, we come into competition with the institute or other boards. If we do not, we may be unable to fall in with plans made by others. I had this difficulty last winter. Our board of agriculture appointed institutes in different parts of the State, at times convenient to itself. When the secretary asked me to send a representative of the station to help him, it happened that previous engagements prevented me from doing so.

It has been said that it is difficult to get inside the granges to work with them. We have no difficulty in my State. I am not a member of the grange, but I have engagements to speak at sixty subordinate granges in our State this winter.

The PRESIDENT. Before announcing the subject open for general

discussion, the Chair wishes to call attention to the fact that it is about time for lunch, and that other questions have been assigned to succeed this. The subject is now open for discussion.

Mr. THORNE. I agree with the last speaker that the stations can not afford to enter into exhibitions of any sort as competitors with the farmers. But I think there is another sort of exhibition which the stations may and should make on every suitable opportunity. That is an illustrative exhibition, such an exhibition as that in this great building in which we are now holding our meetings.

The Ohio Station is making a specialty of producing varieties of wheat and other grains and of fruits. We have arranged at very little expense an illustrative exhibit in which we find our farmers take very great interest. We exhibit it at fairs, and in this way place before thousands of farmers an object lesson appreciated and valued by them, which we could not get before them by any other means. There is no competition. It is the same sort of exhibit we would show the farmers if they came to the station. It carries the work of the station to the farmer and puts it in a convenient place for him to see it.

Now, a word in regard to institute work. We of Ohio feel that the institute is one of the most efficient means by which the stations can disseminate information. I regard the institute as even more important than the bulletins if any comparison need to be made between the two. We have no difficulty in regard to the machinery for working institutes. The State Board of Agriculture, which controls the machinery and the experiment station, are in the most thorough harmony.

Mr. ARMSBY. It seems to me that there is one very important idea underlying this question. The experiment station farm does not exist primarily for the purpose of raising good animals or good crops. It does not have the purpose that other farms do. The crop of the experiment stations is not wheat, or cattle, but *experiments*, and it should exhibit at fairs not cattle or wheat but *experiments*.

Mr. MORROW. There is an exhibit which I think does great good, the exhibition of a real interest in the exhibits of others.

Mr. FAIRCHILD. We of Kansas have made exhibits at State fairs for ten years. We have made them working institutes, not exhibits of the best stock, the best potatoes, or the best corn, but exhibits of all our potatoes, of all our sorghum, and of all our stock. We exhibit at State fairs only. If there is no State fair we make no exhibit. County fairs we can not attend because there is no end to them. The great city shows we do not attend, because they are not to our purpose.

We exhibit our stock as typical, and we arrange beforehand for a place where our stock shall be grouped together, all our breeds. We go through no jockeying or fitting out process, in the sense spoken of by our friend from New Hampshire (Mr. Whitcher). We take pains, however, to have them in good trim and in business order.

We take pains to show all we can in the line of experiments. Last

year, for instance, we showed the varieties of potatoes which our experiment station has cultivated for several years. I think we had 250 kinds, each variety labeled so as to show exactly what the name was supposed to be, if it had a name, and the number if it had no name. We also arranged sweet potatoes in groups, properly labeled. Occasionally a farmer would come up and say, "What are these? They are not half as big as those over yonder." And there was generally interest in examining the whole exhibit of the experiment station.

We did the same with sorghum. Sorghum, you know, is of great interest to us. We have 250 varieties of sorghum growing at our station. It is a wonderful education to our people to see great numbers of varieties.

We have also exhibited a great variety of forage plants. You know forage plants for the dry regions of our State are of great interest to every farmer.

Except for the expense of making exhibits we should consider it the most profitable thing we do. It is expensive, but we feel that so far it has paid.

We consider institutes among the best means of educating the farmer.

MR. ROBERTS. As I understand this question, it is what should be the relation between the colleges and experiment stations and agricultural exhibitions? I think that no college or experiment station should ever enter any products for a premium, and that the officers and boards of control will have to decide in each case on its merits whether it is best to make an exhibit. I am averse to cheapening the work of the colleges or the stations. I do not like to see their work made cheap like the little articles that are thrown in the mud at the fairs and trampled under foot. There is a certain dignity, a certain withholding, that makes a thing sought after.

THE PRESIDENT. Is there any further discussion? If not, the next subject assigned for discussion is "The primary obligations of colleges and stations under the Hatch act." In the absence of those who had been assigned for that discussion, President Hadley has kindly consented to open the discussion.

MR. HADLEY. It seems to me that this subject was almost entirely covered last evening in the address of our honored president. I will therefore endeavor to be brief.

The primary obligations are called for. In order to study those obligations it will be necessary to study the act itself. If the title of an act carries any weight we may learn something from the title of this act. It begins by speaking of agricultural experiment stations in connection with colleges. In the first section it says:

That in order to aid in acquiring and diffusing among the people of the United States useful and practical information on subjects connected with agriculture, and to promote scientific investigation and experiments respecting the principles and application of agricultural science, there shall be established * * * a department to be known and designated as "An agricultural experiment station."

Section 2 of that same act says:

It shall be the object and duty of said experiment stations to conduct original researches or verify experiments, etc.

It is a clear proposition that when a college accepts the grant made by Congress for the agricultural experiment station as a special department, the duties and objects of which are clearly defined, it becomes its duty to carry out the contract very carefully, using the funds granted only for acquiring and diffusing information pertaining to agriculture.

I regard the matter spoken of this morning, in regard to the relations between the colleges and stations and the public at large, as bearing directly on this question.

The PRESIDING OFFICER (Vice-President McInnis). The next speaker is Director Speer.

Mr. SPEER. When Major Alvord asked me yesterday to speak upon this question, I told him I preferred not to do so, because I do not pretend to be a public speaker, and because this is a question that I do not care to talk upon, especially before this audience. The topic does not suit me. I would much rather talk to the question "The primary obligations of experiment stations under the Hatch act."

I was highly pleased when the Association of American Agricultural Colleges and Experiment Stations was organized. I thought the very question I am now discussing would be discussed at its meetings. I am sorry to say that last year I was disappointed. I am sorry to say that this year again I am disappointed. The programmes of the meetings at Knoxville and at this place have had reference entirely to the work of experiment stations.

We have no representative of the Iowa College here this year for the reason that this is our commencement week. Next year I hope that the meeting of this organization will occur at a time when a representative from the Agricultural College of Iowa, can be present, and when he comes I hope he will find upon the programme some discussion that will furnish light upon the question: How can the farmers be benefited by the agricultural college more than they have been?

There is a friendly rivalry between the Iowa college and the experiment station, to see whether the station can not please the farmers better with the expenditure of \$15,000 than the college does with the expenditure of \$15,000 of Government funds besides special appropriations from the State.

The PRESIDING OFFICER. The next speaker is President Holladay.

Mr. HOLLADAY. I believe that I am the newest member of this remarkable Association, and represent the youngest college in the United States. It has only reached the tender age of six weeks, and I would therefore very much rather listen than talk. I came here to learn, not to teach.

The language of the law of Congress which creates experiment stations and provides for their maintenance says that in each of the agri-

cultural colleges created under the act of 1862 there shall be a department known and designated as an experiment station ; and one section of that act, it seems to me, furnishes all the guidance we have. Permit me therefore to read the second section :

SEC. 2. That it shall be the object and duty of said experiment stations to conduct original researches or verify experiments on the physiology of plants and animals; the diseases to which they are severally subject, with the remedies for the same; the chemical composition of useful plants at their different stages of growth the comparative advantages of rotative cropping as pursued under a varying series of crops; the capacity of new plants or trees for acclimation; the analysis of soils and water; the chemical composition of manures, natural or artificial, with experiments designed to test their comparative effects on crops of different kinds; the adaptation and digestibility of different kinds of food for domestic animals; the scientific and economic questions involved in the production of butter and cheese; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective States and Territories.

That section is the definition and measure of the obligations assumed by each State and each college that accepts the benefit of the Hatch fund. We can not perform the duties required of experiment stations without a competent professor of animal and vegetable physiology. We must have a force of experienced chemists, for duties seem to fall upon them more heavily than upon other scientists. We must have an experienced horticulturist and an agriculturist, and possibly, also a dairyman and stockman.

The last phrase of the clause may include almost anything. The experiment stations are required to conduct "such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable."

I wish very much that the time of the meeting of this Association could be so arranged as to suit the convenience of the largest number of those who would be glad to attend. In our past sessions something has been said about the difficulty of securing attendance. If this Association met in vacation time, either in September or immediately at the end of the spring sessions of the colleges, there would not be the slightest trouble in obtaining large attendance. At this meeting, if the time were convenient, from the college to which I have the honor to belong there would be in attendance three professors, at their own expense. It is not a question of money, it is a question of time. They would gladly pay their own expenses to be here if they could be spared from the duties of their respective chairs. They could not be spared, and therefore are not here. I do not know that it is proper for me to allude to this matter at this time, but as another gentleman more familiar with the usages of the Association set the example I have ventured.

The PRESIDING OFFICER. The next speaker is Dr. Atwater.

MR. ATWATER. The act of Congress under which the stations are now organized in its first section states the two general objects for which the experiment stations are established. The first is "to aid in acquiring

and diffusing among the people of the United States useful and practical information on subjects connected with agriculture." The second is "to promote scientific investigation and experiment respecting the principles and application of agricultural science."

In section 2 the duty of the experiment station is stated to be in substance to conduct original researches or to verify experiments which bear directly on the agriculture of the United States with due regard to the varying conditions and needs of the respective States and Territories. Section 3 requires that reports be sent to the Treasury Department and to the Department of Agriculture. Let me say here parenthetically that distinct as is this requirement several of the experiment stations have thus far neglected to send to the Department of Agriculture—at any rate the Department has failed to receive from them—the reports required by law, and have done so notwithstanding the fact that attention has been called to the omission. In section 4 we learn that the stations are to publish and distribute to newspapers and farmers in their respective States and Territories bulletins or reports of progress. From the provisions of this act we learn, therefore, that the stations, as departments of the colleges, have as primary or fundamental functions first to investigate and experiment for the benefit of agriculture, and secondly to publish the results of their investigations for the benefit of farmers. It is therefore a primary obligation of the colleges and stations availing themselves of the benefits of this act to inquire how they can best attain these two objects in the form of their organization, in the methods and character of their experiments and researches, and in the publication of the results of their work.

The report of the House committee on the Hatch bill clearly shows that it was the intention of the framers and promoters of this measure to utilize for the stations all the plant and experience of the colleges. It would seem, then, that in promoting the organization of the stations the several colleges should take into consideration the facilities for work in particular lines and should be ready as far as is consistent to put at the disposal of the stations their buildings, laboratories, farms, apparatus, and books, and thus enable the stations to do thorough and effective work. The stations, on the other hand, should be quick to see what are the special openings for successful work offered by the resources of the colleges and expend their energies largely along those lines rather than branch out in directions where they can not have the support of the colleges in equipment or in experience. These mutual obligations have been generally recognized in the establishment of the stations and it is not necessary to dwell on this subject here.

Regarding the methods and character of the experiments and researches which the stations should undertake, in order to carry out the spirit of the Hatch act there will undoubtedly be more divergence of opinion. A few principles will, however, be generally acknowledged to be correct. The stations should do well whatever they attempt; they

should not attempt too much ; they should endeavor to secure permanent rather than temporary results.

Two years' experience indicates that while the stations have recognized these principles as fundamental, and have industriously and enthusiastically set about their work, they have not always perceived the real limits imposed upon them by the conditions under which they labor. For example, in the effort to do well, to become full-fledged stations, they have in some cases organized more departments of work than their real present needs and opportunities justified. "To do thorough work," they have argued, "we must have specialists in the several departments of agricultural science." Very good ; but thoroughly trained specialists must have good salaries and ample apparatus if the best work is to be done. It is better to divide the funds of the stations among a small number of able and competent men, with sufficient books and apparatus, than to distribute them among a dozen lacking in talent, education, and equipment.

With the pressure that is brought to bear upon the stations to undertake the study of a great variety of problems, and problems of immediate practical interest, there is danger of failure to grasp the larger and profounder problems and to study them in the way that will be in the long run most effective and most creditable.

The American farmer is after all most interested in the solution of certain large problems connected with his profession and is likely to be more patient with a station which holds itself rigidly to careful and thorough investigations of relatively few but important matters than with one which gives him many useful hints on little details but does not undertake any really serious work on his behalf. In aiming to secure a permanent foothold the stations have in some instances supposed that problems must be attacked chiefly, if not solely, from the farmer's stand-point, forgetting that the application of principles in the practice of any art can not rest upon a permanent basis until the principles themselves are discovered. Brilliant success may chance to attend experiments so conducted that every intelligent farmer will comprehend their details, but it is more than likely to be a transient success. If a principle be discovered, the reputation of the discoverer will never wane.

That mistakes and crudities should appear in the work of the station workers is to be expected. If by painful experience they learn to correct their faults, they are only following in the pathway trodden by the wisest of all ages. And it is one of the good signs of their wisdom that they come here to this convention to devise ways and means for improvement. Let me therefore seize this opportunity to outline very briefly what seems to me to be the proper method of proceeding for a station in the conduct of its investigations. 1. By close contact with the farmers of the State the station should ascertain what are the most pressing and important needs of the agriculture of its section ; it should

then select from those problems a few which it feels itself most competent to deal with, and plan experiments which shall be thorough and far reaching, and patiently set itself to work with due regard to all the details which will make the experiments complete.

Time enough should be taken in making the plan to have it reasonably sure that the correct principles of experimentation are perceived and adopted, and that everything necessary to success has been provided for. In other words, under the Hatch act, fairly interpreted, it is the primary duty of the individual station to confine its work to a comparatively limited number of important problems which it may reasonably hope to solve to the lasting benefit of the agriculture of its State. In this way, by such work as is deservedly denominated *scientific*, whether it be in the field, the stable, or the laboratory, can the stations attain that high measure of success which will be of wide-spread and permanent benefit to the agriculture of the United States, and, it may be, of the world. This does not necessarily involve the postponement of important discoveries to a remote future. Indeed, experience shows that when men in any line have attacked problems in a thorough and scientific manner, good results have speedily followed, and the experience of the stations in this country and in Europe points in the same direction.

But under the Hatch act, the station is not only to investigate but to teach, "to diffuse useful and practical information among the people," especially among the farmers. What is the nature of the obligation thus imposed? The information must be useful, not merely interesting; it must be such as can be reduced to practice on the farm. How is this information to be diffused? By bulletins sent to newspapers and to the people. It is not necessary, as we read the act, that this information should be confined wholly to the results of original investigations at the stations, but the station is under obligation to satisfy itself that the information which it collects for publication will be of real service to the farmers in the practice of their art.

Bulletins, then, should be of such a character that the farmer can understand them as he reads, and not only that, but be able to follow out their conclusions and suggestions in his daily work. Explanations and arguments, details of experiment there should be, but everywhere and at all times the writer should remember that he is writing for farmers, for busy men, for practical men. This implies first an appreciation of the real stand-point of the farmer, and, second, great care in writing and editing. It is of no avail for the station worker to plead that too much other work forced him into hasty preparation for publications. It is of little use to perform experiments and get results in our stations, unless these results be put into a form which will make them available to our farmers. The stations will have a difficult task to win the support of the people if the people can not comprehend what the stations have done for them. Undoubtedly there is a great mass of data relating to

experiments which is very valuable and should be recorded, but it ought to be carefully and religiously separated from those brief, clear and practical reports which tell the farmer how good work the stations do. Let us have scientific, technical, minute, reports of experiments for the scientist; and short, well expressed, summaries of experiments, and especially of results, for the farmer.

The PRESIDENT. The Chair will, at this time, announce as the committee on nominations, ordered by the convention at the opening of the morning session, Messrs. Myers, Goodell, Jordan, Plumb, Henry, Voorhees, and Green. Perhaps the committee had better assemble at the platform immediately after the adjournment.

Mr. Halford, the private secretary of the President of the United States, has sent a note to Assistant Secretary Willits, which has been handed to me, in which he expresses regret that the President felt it necessary to be away from the city for two days, and says the President will probably return by Saturday, when he will be pleased to receive the members of this Association.

Is there any further miscellaneous business to be attended to before adjournment? If not, the convention stands adjourned to meet at a o'clock. Let the Chair urge the importance of meeting promptly with 2 full attendance, as there will be various important public measures for consideration.

Accordingly at 12.32 p. m. the convention adjourned.

AFTERNOON SESSION, THURSDAY, NOVEMBER 14, 1889.

The convention was called to order at 2.27 p. m.

The PRESIDENT. First in order is general business, the introduction of resolutions, etc. Are there any general resolutions to be introduced and referred?

The Chair calls attention to the reports from institutions required by the constitution. At Knoxville the institutions were called upon in order to present their annual reports orally within the limit of ten minutes. It was suggested there that the reports in the future should be presented in writing, ready to be filed or read to the convention, as ordered. What is the pleasure of the convention?

Mr. SCOVELL. I move that the reports be filed with the secretary.

The motion was agreed to.

The PRESIDENT. Reports from special committees are now in order. Is the committee on amendments to the constitution ready to report?

Mr. ARMSBY. That committee submits the following report:

The committee to which was referred the subject of provision for the discussion of technical questions, relating to the work of colleges and experiment stations, at the meetings of this Association, respectfully recommends the adoption of the following as an amendment to the constitution:

1. The Association shall be organized into permanent committees upon the several classes of special subjects the consideration of which shall become desirable.
2. Each institution represented in the Association shall be entitled to representation by one delegate.

3. Each committee shall nominate to the convention a chairman to hold office until the close of the next convention. Each chairman shall present at the first general session of the convention a report of progress in his subject during the preceding year, together with any other facts connected therewith which he may deem of interest. Such reports shall not exceed fifteen minutes in length. The annual address of the president of the Association shall be given upon the evening of the same day.

4. Provision shall be made in the programme for conferences of each of the committees, either simultaneously or consecutively as the executive committee shall determine. At least two committees shall each year present in general sessions of the convention a portion of the subjects coming before them.

5. The committees to thus report shall be designated by the executive committee, and general notice of the selection shall be given at least three months in advance. There shall be permanent committees on agriculture, on botany, on chemistry, on entomology, and on horticulture; and

6. The executive committee, upon request of any five institutions represented in the Association, shall provide for the organization of a new committee at any convention.

And the committee further recommends that the executive committee be requested to assign a time for the organization of these committees.

In regard to the different sections of this report, I wish to make a few explanations:

Section 2 is not intended to forbid the attendance of any persons interested at the meetings of conferences, but to define the vote.

As to section 3, I may say that it is the general feeling of the committee that it would be desirable to have the general session, if not the first session, very early in the convention, in order that the reports of the chairmen of committees and the president's address may give tone to the remainder of the convention.

Regarding section 4, it was thought wise to bring some subjects before the Association each year in general session, in order to enlist the interest of the members and to aid in holding the Association together.

The PRESIDENT. The amendment reported by the committee is now before the convention for consideration.

The amendment was adopted.

Mr. ALVORD. The committee on the order of business had referred to it an amendment to the constitution offered by Professor Gulley with regard to honorary membership in the Association. The committee is of the opinion that the membership of the Association is not a personal membership, but a membership of institutions, represented by delegates. The committee reports the resolution offered by Professor Gulley with amendments, and recommends its passage as amended, simply as a resolution of the convention, in the following form:

Whereas certain workers who have aided in scientific agricultural investigations are not connected with the agricultural colleges or the agricultural experiment stations; and

Whereas the presence of such persons will be advantageous to the work of this Association; therefore

Resolved, That the executive committee be instructed to issue, in connection with the call of the annual convention, a general invitation to such persons to attend and participate in the proceedings.

The resolution was adopted.

Mr. ALVORD. The committee on the order of business recommends the following as an amendment to the constitution :

Membership.—Any person engaged in agriculture, who shall attend the convention of this Association, not as a delegate, may, by vote of the convention, be admitted to all the privileges of the floor, except the right to vote.

The amendment was adopted.

The PRESIDENT. The Chair would suggest that the report of the special committee on the form of the annual report be considered. Will Professor Morrow state the point that he wishes the Association to pass upon ?

Mr. MORROW. The committee did not deem it wise to make specific recommendations. The report (see page 81) calls attention to the importance of complying with the law and of promptly preparing reports as full as can be. It can be read if desired, but I think there is nothing that will meet with any criticism. It is only a recommendation calling attention to the importance of complying with the provisions of the law.

The PRESIDENT. Shall the report be received and referred to the committee on publication ?

A motion to that effect was agreed to.

The PRESIDENT. Is the committee on fibrous plants prepared to report ?

Mr. ARMSBY. The report of the committee was made to the experiment station section, and was to be reported from that section to the Association.

The PRESIDENT. Is the committee on uniformity of methods in chemistry ready to report ?

Mr. ALVORD. That committee reported and its report was referred to the committee on the order of business. A modification of that report is made necessary by the adoption of the report just rendered by the committee on amendments to the constitution. The committee on the order of business now reports to the Association, with recommendation that it be adopted, the following amended report of the chemical committee :

Resolved, That this convention recommends that the methods approved by the Association of Official Agricultural Chemists be strictly followed by all agricultural colleges and experiment stations which do analytical work ; but that if, for any reason, it seem necessary in particular cases to change or modify the methods, such change be distinctly noted in the published records.

Resolved, That the permanent committee on chemistry be requested to formulate and report to all concerned a system for uniformity in the expression and record of analytical work at colleges and stations.

The resolutions were adopted.

The PRESIDENT. Has the committee on the order of business anything further to present ?

Mr. ALVORD. The report from the horticulturists presented to the convention this morning. The committee on the order of business

recommends that the report be filed with the proceedings of the convention, to be published with them, and that the recommendations accompanying the report be approved and referred to the permanent committee on horticulture for its guidance.

The recommendation of the committee was adopted.

Mr. ALVORD. The committee on the order of business reports with the recommendation that it be adopted, the following substitute for the resolutions offered by President Clute:

Whereas the interests of the experiment stations demand that the results of foreign investigations and experience in the lines pursued by our stations be made available to workers here as soon and as fully as practicable; and

Whereas the constantly increasing amount of experimental work in this country and abroad renders imperative the preparation of careful and thorough compilations and indexes of past and current investigations; and

Whereas such work demands talent and training of a relatively high order:

Resolved, That this Association regards it as essential to the economic effectiveness and highest practical success of the experiment stations throughout the country that Congress grant such increase of appropriations for the Department of Agriculture as will enable it to enlarge its usefulness by prosecuting this work and to secure for this purpose the services of the most competent men.

Resolved, That a copy of these resolutions be transmitted to the Secretary of Agriculture and to the chairman of the Committee on Agriculture in each house of Congress when organized at its coming session.

The resolutions were adopted.

Mr. ALVORD. The committee on the order of business asks leave to make further recommendations in regard to matters to come before the Association from the experiment station conference as they are presented.

The PRESIDENT. Reports from that conference are now in order. Is the conference of station workers ready to report? Its chairman was Dr. Atwater, I believe.

Mr. ATWATER. I will ask the secretary to read the report.

Mr. THORNE. The instructions given after the brief verbal report made yesterday morning were that the proceedings of the conference should be embodied in brief minutes to be presented entire to the Association. I accordingly read as follows:

Minutes of a conference of experiment station workers.

The first conference was held Tuesday afternoon, November 11, 1889.

The meeting was organized by the election of Prof. W. O. Atwater as president, and Charles E. Thorne as secretary.

Dr. Armsby presented the following series of resolutions, addressed to the Association by the Pennsylvania State Board of Agriculture:

(See textile fibers, page 105.)

Professor Morrow moved that a committee of three be appointed by the chairman of the section to consider and report to the Association on the matter of experiments with hemp, flax, and other fibrous plants.

The Chair subsequently named Messrs. Armsby, Scovell, and Speth for this service.

Mr. Neilson, of New Jersey, called attention to the necessity of providing for the translation and editing of the reports of European stations, and expressed the hope

that the Office of Experiment Stations might find it possible to undertake this work. This feeling was heartily concurred in by other speakers. The difficulties in the way of executing the work were briefly pointed out by Professor Atwater.

Stations have been in existence in Europe for more than forty years, and now the total sum of their publications is simply enormous; yet the work they have done lies at the foundation of that required by American stations, and until some sort of collating of that work be done, much of the work done here must be done at an enormous waste of time, strength, and money.

Professor Atwater stated that a beginning had been made in this work, however, and that the only impediment to progress in it was lack of the necessary funds for prosecuting it. Professor Atwater referred to the necessity for giving, first attention to the reports of our own stations, and alluded to the beginning already made in this direction.

Director Henry urged that the Office of Experiment Stations be encouraged to continue this work of placing the substance of both European and American investigation in compact form for the use of station workers. In this he was supported by several others.

Director Scovell stated that his station had commenced an index of the reports of the various American stations, and had found it a much greater task than was expected. The necessity for such an index, and the great waste of energy involved in each station's preparing it independently were dwelt upon.

In discussing the general form of bulletins, Director Jordan emphasized the necessity for making them more terse, and of stating their results in simpler and plainer language. He would place the summary of the contents of the bulletin on the first page, making it in short, a combination of summary and table of contents.

Professor Plumb presented the following resolutions:

Resolved, That this section of the Association of American Agricultural Colleges and Experiment Stations express its emphatic disapproval of station publications containing offensive personalities or abusive references to the educational or other work of persons or institutions.

The resolution was unanimously adopted.

On motion of Professor Roberts, it was resolved that the minutes of the meeting be reported to the general Association, with request that they be made part of the record of that Association.

An informal discussion followed on the size, form, contents, and printing of station bulletins, in which attention was called to the fact that the bulletins in some States are published by the State, in which case the size and form are more or less under the control of the State printers; for guidance in other cases attention was called to the proceedings of the Knoxville convention of this Association.

Director Speer asked for information relative to the State publication of reports and bulletins and the securing of State appropriations for buildings. Director Thorne stated that in Ohio the printing of the annual report of the station had been provided for in the State law creating the station; by special legislation enacted last winter the State printer was required to print his annual report substantially in monthly installments, the annual report proper being limited to a summary of the results of the year's work. It was stated that a large number of names of persons had been obtained by applying to members of the legislature for names of farmers in their respective districts, and offering to stamp on wrapper of first copy sent to such names a statement that bulletins would be sent free during the year at the request of the gentleman by whom the names were furnished. The fear was expressed that the placing of matter of this character on the bulletins was not admissible, but it was replied that the Post office authorities had given special permission to stamp the wrappers as described. This introduced the general question of what may and may not be sent under the frank of the stations. It was the sense of the meeting that matter relating directly to the experimental work of the stations might properly be so sent, but nothing else. It was believed that the including in whole or in part of the bul-

letins of stations of other States than that in which the bulletin was issued was legitimate.

In the collection of the names of persons to whom to send bulletins, Director Scovell has employed a plan similar to that used in Ohio. Director Speer has sent letters to county treasurers, and when these failed to respond to county auditors, and had received a very liberal response. Dr. Jenkins stated that the Connecticut Station had obtained names by addressing leading farmers and farmers organizations in each town.

Directors Roberts and Stockbridge deprecated the attempt to collect large lists of names, believing that little advantage could be derived from sending the bulletins to any except those who are sufficiently desirous to receive them to request them.

A number of gentlemen, however, urged the importance of more general distribution, on the ground that the bulletins were often very useful, even among those who did not at first appreciate their value.

Directors Stockbridge, Cooke, and Redding related experience in securing the distribution of bulletins through the country newspapers, either by sending the papers brief abstracts for publication or by inducing them to include bulletins as supplements. In this way Messrs. Cooke and Redding had distributed 40,600 to 75,000 copies of certain reports.

On motion a committee of five, consisting of Messrs. Thorne, Neale, Halsted, Alwood, and Clute, was appointed to prepare a programme for the meeting of this division of the Association provided for by the programme of Wednesday.

The meeting then adjourned until 2.15 p. m. Wednesday.

CHARLES E. THORNE,
Secretary.

Minutes of conference of experiment station workers, Wednesday, p. m.

The conference was called to order by Professor Atwater.

Professor Armsby presented the following report from the committee on vegetable textile fibers, which was accepted:

"The committee appointed to consider the subject of experiments upon textile fibers respectfully reports that it has had a very interesting and profitable conference with the Assistant Secretary of Agriculture upon this subject and upon the question of co-operation in such experiments between the several experiment stations and the Department of Agriculture.

"The Assistant Secretary stated to your committee that the Department would be in condition in the near future to distribute to the several experiment stations seeds or roots of varieties of the several fiber plants and to test machinery for the preparation of the fiber.

"Your committee therefore recommends the passage of the following resolution:

"*Resolved*, That the Department of Agriculture be requested to initiate, in co-operation with the several experiment stations, experiments upon the growth and manufacture of vegetable fibers, the experiment stations to undertake the culture and testing of varieties and the Department of Agriculture to procure and distribute seeds, etc., of the several varieties and test machinery or processes for the preparation of the fiber.

"Your committee further recommends that the Assistant Secretary of Agriculture be requested to present to this meeting the views and purposes of the Department upon this subject.

"Respectfully submitted.

"For the Committee,

"H. P. ARMSBY,
Chairman,
"M. A. SCOVELL."

Mr. Hicks announced that a member of the U. S. Geological Survey, Mr. Willis, was present and prepared to address the conference on the work of the survey in

classifying soils. Mr. Willis was invited to speak, and on the close of his address a vote of thanks was tendered him.

Mr. Hicks moved that a committee be appointed to formulate the sense of the convention respecting the work of soil classification. Messrs. Hicks, Stockbridge, and Whitney were subsequently appointed. The committee on programme reported, by Dr. Neale, recommending that the conference separate into sections of agriculture, horticulture, entomology, botany, and chemistry, to meet again in general conference at 4.30. The report was adopted and the conference adjourned.

On re-assembling, Dr. Jenkins, from the section of chemistry, reported the following resolution, which was adopted:

"Resolved, By this Association that in all official dairy tests made under the direction of the experiment stations, or their chemists, the method adopted by the Association of Official Agricultural Chemists be used, in order that the results be as uniform as possible."

Dr. Riley, from the Association of Economic Entomologists, then presented the following:

"Resolved, That a committee be appointed to act in connection with the Association of Agricultural Colleges and Experiment Stations.

"Resolved, That it is the opinion of the Association of Economic Entomologists that the bulletins of the experiment stations and agricultural colleges should not contain descriptions of new species.

"Resolved, That in our opinion we, as officers of experiment stations, should be slow to recommend, even by mention, any insecticide until, by analysis and test, we find it worthy of recommendation."

The second resolution precipitated an animated discussion, which continued until the close of the session. Dr. Jenkins finally moved that the resolutions be received and entered upon the minutes.

CHAS. E. THORNE,
Secretary.

Mr. ALVORD. The committee on order of business recommends that the minutes of the conference of station workers be entered on the records of the convention, to be edited therewith, and that the following action be taken upon the various recommendations of that conference:

- (1) That the resolution regarding personalities in station publications be confirmed.
- (2) That the resolution regarding dairy tests be confirmed.
- (3) That the communication and resolution from the Association of Economic Entomologists be laid on the table.
- (4) That the resolution regarding co-operative experiments in fiber plants be adopted.

The recommendations of the committee on the order of business were adopted.

The PRESIDENT. The Chair announces as the committee provided for by the resolutions offered by Dr. Halsted, Messrs. Halsted, Clute, Jenkins, Morrow, and Gulley.

The Association will now hear the report of the committee on nominations.

Mr. MYERS. Your committee on nominations beg leave to submit the following nominations:

For president, President James H. Smart, of Indiana.

For vice-presidents, President M. E. Gates of New Jersey, President G. T. Fairchild of Kansas, Director F. A. Gulley of Texas, Director R. J. Redding of Georgia, and Director E. W. Hilgard of California.

For secretary and treasurer, Director H. P. Armsby of Pennsylvania.

For members of the executive committee, Presidents Henry E. Alvord of Maryland, Stephen D. Lee of Mississippi, and Wm. H. Scott of Ohio; Director M. A. Scovell of Kentucky and Vice-Director E. H. Jenkins of Connecticut.

The PRESIDENT. You have heard the report of the committee. What action will be taken?

Mr. COOKE. I move that the secretary be instructed to cast the ballot of the Association for the persons named.

The motion was agreed to.

The secretary cast the ballot.

The PRESIDENT. The gentlemen whose names were read are duly elected.

Is there any further business?

Mr. MORROW. On behalf of the University of Illinois and the Illinois Agricultural Experiment Station, I extend a very hearty and sincere invitation to the Association to meet next year at Champaign.

Mr. STOCKBRIDGE. There is more than one candidate for the honor of entertaining the Association next year. On behalf of Purdue University I would like to assure you that the latch string is out, and that we will consider it a most gratifying consideration if it be possible for the Association to meet with us at the Purdue University next year. I would not at this time urge any particular reason for assembling at La Fayette, rather than at any other place; but I will state that there seems to be a generally prevailing opinion that for next year a location more central than that which has been adopted during the two previous years would for many reasons be advisable, and that such a location should at least be west of the Alleghenies and north of the Ohio River. Such conditions are eminently fulfilled, I believe, by the city of La Fayette and Purdue University. The hotel accommodations and railroad facilities are all that could be desired. The invitation is extended for your earnest consideration.

Mr. SHACKELFORD. We extend to you an invitation to come to Lexington, Ky., and if you accept the invitation, we will give you a hearty welcome.

Mr. HADLEY. It is evident that some institutions are not represented here because they belong to the far west. The next meeting should go to them. I invite the Association to meet in New Mexico. (Applause and laughter). We have ample hotel facilities, and we can assure you that you will be hospitably treated. We have an abundance of outdoors and a great variety of elevations. In these respects you certainly can be satisfied. If you desire, we can take you to Santa Fé, probably

the oldest city on the continent. If that does not suit you, we can give you the Rio Grande Valley.

The PRESIDENT. The Association has heard the invitations and the executive committee will give them consideration.

Mr. TURNER. I understand that Dr. Merriam, the Chief of the Division of Ornithology and Mammalogy of the Department of Agriculture, is present. His investigations are of interest to this Association, and I therefore move that he be given an opportunity to address us.

The motion was agreed to.

Mr. C. HART MERRIAM. I wish to say a few words in behalf of one feature of the work now being done in the Division of Economic Ornithology and Mammalogy of the Department of Agriculture.

Every member of this audience knows that certain animals and plants inhabit certain definite parts of the earth's surface and do not occur elsewhere. For instance, you know that the lion, the chimpanzee, and the ostrich are found in Africa; that the white bear is found in the polar regions; the tapir in Central and South America; the palm tree in the tropics; the cactus, sage-brush, and grease-wood in the arid regions of the west; and that our heaviest forests grow along the northwest coast of the continent. Perhaps you have gone further and have associated the presence of these forms of life with certain definite physiographic conditions which characterize the areas in which they occur. But I doubt whether you appreciate the intimate relations which exist between the work of the experiment stations and the limitations of these natural life areas.

It is our purpose to map the life areas of the United States, to ascertain the limits of the provinces which are characterized by the presence of definite associations of birds, mammals, reptiles, and plants. Here is a provisional map of North America, showing the primary and some of the secondary life provinces. [Map exhibited].

I particularly wish to call your attention to the fact that the agricultural experiment stations may increase the utility of their work a hundred-fold—I think it not an exaggeration to say a hundred-fold—by giving the farmer the benefit of the practical results derived from a study of the natural life areas. Reference to a map of these life areas shows the farmer the experiment station situated in the particular area in which his farm lies. The records of this station should show him what crops his farm is likely to produce with greatest profit, thus saving him the cost of experimenting. Of course the soil and minor local conditions will need to be taken into consideration. I ask, therefore, the earnest co-operation of the experiment stations in accumulating the facts needed to complete these maps.

The PRESIDENT. The Chair would like to ask for the information of the Association whether these maps have been printed in such numbers that they can be furnished to the stations?

Mr. MERRIAM. These are manuscript working maps which are under-

going constant change. As soon as they are reasonably complete they will be published for the use of the stations.

Mr. ATWATER. I have had some conference with Dr. Merriam about this work and have found it extremely interesting. I am thoroughly persuaded that it is one of the numerous investigations necessary to a thorough knowledge of the agricultural capacities of our country.

Mr. ALVORD. The committee on the order of business offers a resolution and asks that the convention allow Dr. Eggleston, recording secretary of the American Forestry Congress, five minutes to speak on the subject of forestry.

Resolved, That this convention invites the attention of colleges and stations to the action and recommendation of the American Forestry Congress, as communicated to this body, and advises hearty co-operation in the purposes of the communication received.

The PRESIDENT. Will Dr. Eggleston respond?

Mr. EGLESTON. Some members of the Association will remember that, on behalf of the Forestry Division of the Department of Agriculture, I urged a few years ago the establishment of experiment stations in every State. Since then they have been established for agricultural purposes. Now, I appear in behalf of the American Forestry Association, whose resolution, adopted at their annual meeting three weeks ago, has been officially presented by me to your body. I wish to say on behalf of that association, comprising a small number of gentlemen who gather from all parts of the country year by year for the purpose of interesting the public in forestry, that we wish to secure the co-operation of the agricultural colleges and experiment stations. We feel the need of their help, and with confidence appeal to them for their help.

There is a German apothegm: "No forest without culture; no culture without forest." We have not yet reached the time when the public sees the close connection of these two things, but we are coming to it. The experiment stations, scientific institutions, looking beyond the present, can forecast the needs of a generation hence. It seems appropriate that they should now commence a series of experiments on forestry, such as may seem best to each station in view of the particular needs of its State.

We would consider it a great favor and a great help if the officers of the colleges and experiment stations would, as they have opportunity, make known at farmers' institutes and similar gatherings, the connection of forestry with agriculture.

The PRESIDENT. Has the committee on the order of business anything further?

Mr. ALVORD. The committee recommends that this evening opportunity be given for the permanent committees to meet in order that their organization may be perfected and reported before the close of the day's proceedings.

The PRESIDENT. It will be observed that according to the programme, we meet at 7 o'clock and divide into two sections. These meetings of the permanent committees may take the place of those of the sections.

Mr. SCOVELL. I move that we adjourn.

The motion was agreed to, and accordingly at 3.32 p. m. the Association adjourned to meet at 7 p. m.

EVENING SESSION, THURSDAY, NOVEMBER 14, 1889.

The PRESIDENT. The programme calls for a division into sections. Are we ready for such a division now?

Mr. ALVORD. I think that many of the delegates are expecting to spend the evening in section discussions, and perhaps we had better not attempt to transact any business in general session to-night. Our programme extends till to-morrow noon, and I move, on behalf of the committee on order of business, that to get the business of the Association into proper form, a business session be held to-morrow morning, beginning at 9 o'clock, before proceeding to the conference of station workers provided for in the programme.

The motion was agreed to.

The PRESIDING OFFICER (Mr. McInnis). The Association now stands adjourned till 9 o'clock to-morrow morning.

At 8 p. m. the Association adjourned.

FOURTH DAY.

MORNING SESSION, FRIDAY, NOVEMBER 15, 1889.

The Association was called to order at 9.23 a. m.

The PRESIDENT. The order of last evening provided for a business session at this time. What is the pleasure of the Association?

Mr. ALVORD. The committee on order of business desires to announce that there is no intention of changing the programme decided upon last evening which contemplated a business meeting, to be followed by a conference of station men. With the exceptions that I will mention, the matters of the nature of resolutions or new business in the hands of the committees should be referred to this conference. The committee reports, with recommendation that they do pass, the following resolutions:

Resolved, That the U. S. Department of Agriculture be requested to procure and distribute to the several stations statistics showing the amount of aid such stations have received from their respective States.

The resolution was adopted.

Resolved, That the treasurer of the Association be authorized to call upon each institution entitled to membership for a contribution of \$10, to be paid before the first day of July, 1890.

The resolution was adopted.

The committee to audit the treasurer's accounts begs leave to report that it has compared the statement of the treasurer with the vouchers in his hands and finds the statement to be correct.

The report was received and ordered on file.

Mr. GOODELL. I offer the following resolution:

Resolved, That the publication of the proceedings of this convention, including the president's address in full, be referred to the executive committee in co-operation with the Department of Agriculture, with the recommendation for expeditious action and full authority to edit the same.

The resolution was adopted.

Mr. HICKS. I wish to introduce the following resolution:

Resolved, That we recognize the great importance of the investigation of the soils of the United States, indicated by act of Congress and by the recommendations of the Secretary of Agriculture, but we recognize also the difficulties involved in such investigation, and therefore request such aid as the Department may be able to furnish, including especially the collating and publishing of the results of investigations at home and abroad.

The resolution was adopted.

Mr. ALVORD. One of the questions in the question-box which should have been sent to the conference of station workers I venture to bring up now.

"Can we mail bulletins of the United States Department of Agriculture and of the State stations under our frank?"

It seems to me that the only answer possible is no; but I bring the question up that it may be referred to the executive committee in the hope that it may be possible to obtain an official answer to it.

The question was referred to the executive committee.

Mr. HALSTED. The committee appointed to consider the work of the United States Department of Agriculture begs to make the following report, in the form of a resolution:

Resolved, That the Association of American Agricultural Colleges and Experiment Stations hereby expresses its hearty appreciation of the generous support given it by the United States Department of Agriculture; and in view of the great economic, as well as scientific value of the work which has been, and is now being done by the specialists in that Department, as exhibited in monographs and bulletins issued from time to time, this Association respectfully urges upon the honorable Secretary of Agriculture the advisability of publishing such work, as soon as completed, for the immediate use of the agricultural colleges and experiment stations.

Mr. ATWATER. As an officer of the Department, I would like to say that we are very seriously crippled for want of money to print. The appropriation for this year was made on an old basis, suited to the needs of the Department as it was two or three years ago. Since then some new divisions and the Office of Experiment Stations have been established. There is now a large accumulation of valuable material prepared at great cost in time, labor, and money, which we are unable to print because we have not the money.

Mr. ALVORD. I beg leave to ask a question. Do I understand that the amount for the present fiscal year is only the same as for the year preceding?

Mr. ATWATER. I have forgotten; but I think it is. At any rate, it is only \$30,000 all told.

Mr. ALVORD. Exactly; but I think it stood at \$20,000 in the appropriation bill as reported by the Finance Committee of the Senate, and I have a very distinct recollection of how it was raised from \$20,000 to \$30,000. Is not that right, Mr. Harris?

Mr. HARRIS. You are right, but the Department had in all about \$41,000 the year before (the fiscal year ending June 30, 1889), \$30,000 by the original appropriation and an addition of nearly \$11,000 in deficiency appropriations.

Mr. HALSTED. The object of the committee in reporting this resolution was to help the Department to get the funds needed for the publication of its work.

The PRESIDENT. Are there any further remarks to be made upon this resolution?

The resolution was adopted.

The PRESIDENT. The Chair will at this point make two communications:

There will be held in the room of the Assistant Secretary of Agriculture, at 11 o'clock this morning, a conference of gentlemen interested in forestry, to consider what action Congress should be asked to take in regard to the timber lands on the public domain. All interested are invited to participate.

I have a personal letter from President Fernald, of Maine, whom we all remember. The Association will be glad to hear that he sends his most cordial wishes for the success of this convention.

Mr. ALVORD. I ought to announce that President McLouth, of South Dakota, and President Chamberlain, of Iowa, have written, expressing their regret that business matters have made it impossible for them to be here. I also wish to state that the president of the Guelph Agricultural College, of Ontario, Canada, who was invited to attend the convention, replied that he had arranged to come, but was prevented at the last minute, and politely intimated that if invited, he would be glad to attend the future meetings of the Association.

Mr. MCINNIS. As no provision was made yesterday for a permanent committee on college work, and as it is now impossible for such committee to meet and organize and report back to the Association, I offer the following resolution:

Resolved, That a committee of five be appointed by the Chair to consider questions related to college management, and to suggest to the executive committee subjects for discussion at the next meeting of this Association.

Resolved, That the retiring president of this Association shall be chairman of this committee.

The PRESIDENT. These resolutions, as the Chair understands them, provide practically for the creation of a new permanent committee, although at the present it would rank as a special committee.

The resolutions were adopted.

Mr. PRESIDENT. What further business?

Mr. SCOTT. I would like to ask whether there will be a meeting of college men this morning to hear a report of the committee appointed to confer with the War Department in respect to military matters?

The PRESIDENT. The Chair will state that the committee has had two protracted sessions, one night before last running up to about 1 o'clock, and one last night, running up to half past two, and that the committee has gone over its work very carefully. The War Department submitted to the committee a large number of documents, which have been considered with great care, and the results are being prepared for presentation to the War Department. That presentation can not, of course, be made until after adjournment. The committee, therefore, can now only report progress. The Chair, as a member of that committee, will say that there is no difference of opinion among the members of the committee, and the committee is entirely confident that

its view will meet with the approval of the colleges concerned. The only thing to be done is to leave the committee to complete its work and report by circular.

Mr. ALVORD. As a matter of form, I move that the report of progress be accepted, and that the committee be continued with authority to report its final action to the executive committee for distribution to the Association. (See Appendix D, page 126.)

The motion was agreed to.

The PRESIDENT. Is there any further general business? The programme calls for final adjournment at noon to-day, but the Chair understands that, according to the action of yesterday, the adjournment this morning, to give opportunity for the meeting of conferences, will be the final adjournment of the Association. Is that the wish of the Association?

Mr. PORTER. Would it not be well to have the final adjournment after the meeting of the sections? They may have something to report on which it may be desirable for the Association to take action.

The PRESIDENT. The Chair would suggest that it might be well to authorize the conferences or permanent committees to report to the executive committee. The committees should this morning report their organization. The Chair will call upon them. Will the committee on agriculture announce its chairman?

Mr. PLUMB. Professor Gulley is chairman of the committee on agriculture.

The PRESIDENT. The Chair will now call the committee on botany.

Mr. HALSTED. Professor Tracy is chairman of that committee.

The PRESIDENT. The committee on chemistry.

Mr. SCOVELL. In the absence of the secretary, I will announce that Mr. C. W. Dabney, jr., was elected chairman.

The PRESIDENT. The committee on entomology.

It was announced that Mr. S. A. Forbes had been elected chairman.

The PRESIDENT. I will next call on the committee on horticulture.

Mr. ALWOOD. That committee elected Mr. W. J. Green chairman.

The PRESIDENT. Are there reports from any of these committees?

Mr. MORROW. I heard the chairman of the executive committee make a very important remark. I hope that the President will impress it upon all of us.

Mr. ALVORD. Will the gentleman kindly repeat it?

Mr. MORROW. It was to the effect, that while large latitude is given to the committees, anything involving the credit of the Association must be referred to the Association.

The PRESIDENT. The Chair takes pleasure in responding to that suggestion. Our name, in order to have weight, must be used only by authority of the Association itself. That is a first principle and it is not necessary to dwell upon it.

Mr. ARMSBY. I want to call the attention of the chairmen of the permanent committees to the standing rule adopted yesterday, making it the duty of the chairman of each committee to present at the first general session of the next convention a report of progress in his department, not to exceed fifteen minutes in length. I want to urge upon them the importance of having their reports ready at that time.

It was the understanding that the chairmen of the committees, in conjunction with such other officers as the committees may see fit to appoint, should forward to the executive committee, a considerable time before the meetings, programmes for the committee meetings, in order that they may be included in the general programme. As the executive committee must arrange the times for the meetings of the committees, they must be informed of their programmes, which will show what meetings can be held simultaneously.

The PRESIDENT. The Association has heard these suggestions. The Chair considers it of the greatest importance that we begin well with the summaries or résumés of the work of the several departments. Is it not also pertinent to suggest that set papers, prepared under authority of the committees, would form a basis for discussion, and also be a real contribution to knowledge?

Mr. HENRY. I move that we adjourn *sine die*.

The motion was seconded.

The PRESIDENT. Will the gentleman from Wisconsin withdraw his motion for a moment, in order that the Chair may recognize Professor Atwater?

Mr. HENRY. Certainly.

Mr. ATWATER. I offer the following resolution:

Resolved, That this Association hereby expresses its hearty appreciation of the efficient and faithful services of the retiring officers, especially of the president and secretary.

If the gentlemen referred to will kindly close their ears for a moment, I will say that those of us who have watched the work of this Association from year to year, seeing how successful it has been, seeing how earnest, enthusiastic, and united we are, can not help expressing our feeling that our officers by their faithful and efficient services have contributed very much to the usefulness and profit of the Association.

Mr. HICKS. I second the motion.

Mr. ATWATER. (Putting the question.) Those who are in favor of this resolution will please say aye.

The vote was unanimous.

Mr. HADLEY. Just a word. The invitation I gave the Association to meet next year in New Mexico was presented in good earnest, but I had little hope when I gave it that it would be received otherwise than as a pleasantry. Since that time, however, several persons have told me they would be glad to have the Association meet with us. So I a second time

extend my invitation to the Association to come to New Mexico for its next meeting. I feel confident that I can secure for the members of the Association every railroad accommodation that can be got inside of the jurisdiction of the Interstate Commerce Commission. I believe we can raise in New Mexico from \$500 to \$1,000 to help defray the expenses of the Association. At Las Vegas we have as good a hotel as is to be found on the continent, and as beautiful a place to rest in as can be found anywhere. Everybody likes to visit old Santa Fé. Albuquerque and other places have ample accommodations for such a body as this. If you come in the month of September we will show you as fine a display of fruits and vegetables, grapes, etc., as you can find in the country. In serious earnestness, I tell you that if you come everybody in New Mexico will be ready to give you a most hearty and a most hospitable welcome. (Great applause.)

Mr. ALVORD. I move the adoption of the following resolution :

Resolved, That the thanks of this Association are due and are hereby heartily tendered to the officers of the Department of Agriculture and of the Smithsonian Institution for their many and well appreciated courtesies in connection with this convention.

The resolution was unanimously adopted.

Mr. FAIRCHILD. I move that this Association express its appreciation of the favors granted by certain railroads in giving reduced rates to delegates attending this Association.

The resolution was adopted.

The PRESIDENT. The Chair will announce as the members of the permanent committee on college work to be appointed, Messrs. McInnis, Smart, Goodell, and Broun.

Is there any other business to come before the convention ?

Mr. ALVORD. In order that the subsequent meetings of this body in sections may properly enter into the final records of the convention, I move that the general session of this convention do now close, leaving opportunity for meetings of the conferences, the proceedings of which may go into the records. (See Appendix B, page 119.)

The motion was agreed to.

The PRESIDENT. Before putting a motion to adjourn, the Chair begs the indulgence of the Association, while he expresses the gratification which he thinks all feel, barring minor suggestions of dissatisfaction with some of the necessary conditions of our work, that the Association has now reached a point of greater unity and coherence, and at the same time of flexibility, than it has ever before enjoyed. Without wishing to controvert the views of those who have felt that their time was not fully and wisely spent here, I will say that, in my judgment, this is the most important and most profitable meeting of the Association since its organization. I am confident that we shall find that we have in this meeting laid the foundation for a growth and vigor that but for its action would have been permanently wanting. The seeds of disinte-

gration would very soon have begun to germinate had not some such reorganization as has been provided for here been effected. I therefore congratulate the Association. I especially congratulate the Association upon the unity of purpose that has animated our work, and upon the provision for the future.

I desire to extend to the Association my warmest and most earnest thanks for the great courtesy, forbearance, and consideration with which I have been supported during my occupancy of the chair, a period I shall always look back on with great satisfaction.

The Association now stands adjourned.

Accordingly, at 10.15 a. m., the Association adjourned *sine die*.

APPENDIX A.

CONFERENCE OF EXPERIMENT STATION DIRECTORS, FRIDAY, NOVEMBER 15, 1889.

The conference was called to order at 10.20 a. m., by the chairman, Mr. Atwater. The discussion of "subjects needing special consideration" was taken up by Mr. Plumb. In regard to the organization of stations, he said that they were organized in two ways: some had directors who were the real heads of their stations, overseeing, planning, and co-ordinating the work of the staff; in other stations the director was merely an executive officer acting as the agent of the station council, made up in various ways; in this case he usually had but small influence in planning or arranging the work of the station, each officer being to all intents and purposes independent in his own department. He thought the first method the better when a good director could be secured, otherwise he preferred the second.

In speaking of the demand recently made by newspapers that the seed distribution now made by the U. S. Department of Agriculture should be transferred to the stations, he expressed the opinion that the transfer would increase the cost of the work and would injure the stations by burdening them with executive functions.

He next referred to the fact that legislation does not determine whether the stations may or may not publish, as bulletins, matter which is not the result of their own investigation. He thought the collation and distribution of knowledge already obtained should be left to some one agency, such as the office of Experiment Stations of the U. S. Department of Agriculture, and that the stations should print as bulletins only the results of their own work.

He urged the desirability of securing representation in the meetings of the Association of the various bureaus and divisions of the U. S. Department of Agriculture other than the Office of Experiment Stations, which had always taken an active part in the meetings.

Mr. Armsby said that by the amendment to the constitution, providing for permanent committees, the Department of Agriculture, as a member of the Association, was already entitled to one representative in each permanent committee.

Mr. Alvord presented the following questions from the question box: (1) How do stations keep their mailing list—on cards or otherwise? (2) If on cards, are the names kept alphabetically on separate cards, by post-offices or by counties? (3) Is it not advisable and practicable to adopt a simple, uniform method of numbering bulletins, as ten years from now it will be difficult to distinguish Bulletin No. 7, Vol. III (thirteenth series), No. 7, from Bulletin No. 37½, Vol. VI (ninth series), No. 7, especially if no date of publication is anywhere indicated?

Mr. Burney said that many stations neglected to send annual reports to all the workers of the stations. He thought it important that all should have them. Mr. Alvord agreed with him and expressed surprise that the stations had not done so in view of the very emphatic recommendation of the Knoxville convention in regard to the matter. Mr. Fairchild thought that in many cases it was an oversight of the clerks who had the distribution of publications in charge. Mr. Porter said that when the annual reports were printed by the State the editions might be too small to allow of supplying all the workers.

At 10.35 a. m. the conference adjourned *sine die*.

APPENDIX B.

MINUTES OF THE PERMANENT COMMITTEE ON AGRICULTURE.

The committee met at 3:30 p. m. Wednesday, November 13, and elected as temporary chairman F. A. Gulley, and as temporary secretary C. S. Plumb. These gentlemen were afterwards made permanent officers.

By invitation, through Mr. Myers, the committee adjourned to meet with the committee on chemistry until 4 o'clock. After reassembling Mr. Davenport asked for discussion on methods of testing dairy breeds. By vote it was decided that minutes should be taken and reported to the convention for incorporation in the proceedings. Mr. Whitcher described methods of testing breeds in New Hampshire. Mr. Davenport asked, "Shall we consider the chemical as a true test of dairy breeds?" Mr. Phelps thought that churnability should also be taken into account. Mr. Morrow agreed with him. He had been impressed when in England by the agreement he found between the churn and the chemical tests. Mr. Jordan said that the Maine Station in testing breeds weighed every mess of milk, determined the composition of the milk, compared the cream and butter from each cow with that from the others for five consecutive days at the beginning of each month. In determining the characteristics of a breed, comparison was made between weights of cream and of butter, of fat and of butter, of milk and of cream, etc. One of the station force was engaged in studying milk globules.

Mr. Gulley said that agriculturists were as much interested in milk analyses as chemists. In making feeding tests of cotton-seed meal he found that the food influenced the churnability of the milk, the character of the butter, etc.

Mr. Roberts, of New York, said that the failure to recover butter fat is due (1) to the manipulation of cream; (2) to the time of milking; (3) to the character of food; that churnability is favorably influenced by reducing the viscosity of the milk. He thought it surprising how little is known of methods of converting milk into butter and cheese.

On motion of Mr. Plumb, Messrs. Roberts and Davenport were appointed to act with the Chair as a committee to recommend a plan for permanent organization.

The following were among those present at this meeting: Messrs. Balentine, Davenport, Gulley, Hayward, Hickman, Jordan, Menke, Morrow, Phelps, Plumb, Roberts, Stockbridge, and Whitcher.

The committee met at 8 p. m., Thursday, November 14. The committee on permanent organization reported, recommending—

(1) That the name of the organization be the Permanent Committee on Agriculture of the Association of American Agricultural Colleges and Experiment Stations.

(2) That the officers be a chairman, a secretary, and an executive committee, to consist of the chairman and secretary of the committee and three others.

(3) That the officers be elected by ballot unless otherwise ordered, and hold office for one year or until their successors shall be elected.

(4) That the programme provide for brief papers to be followed by general discussions.

(5) That during discussions each speaker be limited to five minutes.

(6) That the programme be prepared and forwarded to the secretary of the Association for printing with the convention programme three months before each meeting.

(7) That the committee request of the Association (a) that at each convention provision be made for three sessions of three hours each of the permanent committees; (b) that the full programme for each day be posted from day to day; (c) that these provisions be subject to change by the convention at any time; (d) that the full programme be mailed to all members of the association two months before each convention.

The recommendations of the committee were adopted.

Mr. Henry discussed "dairy experiments at experiment stations." He thought we ought to know the relation between the work of the agricultural chemist and the butter tester. He advised caution in testing breeds of cattle. Mr. Whitcher asked whether butter tests should be based upon butter, fat, or churn. Mr. Alvord protested against butter tests not based on the product of butter as butter. Mr. Roberts thought we ought to use the chemist first and the churn second in testing. Messrs. Phelps and Armsby thought the chemist's tests of primary importance. Mr. Roberts asked, "What is butter?" No one answered. The question was discussed by Messrs. Armsby, Balentine, Henry, Morrow, Cook, Atwater, Scoville, Jordan, and Myers. The following resolution, presented by Mr. Plumb, was adopted:

"Resolved, That the chairman of this committee appoint a subcommittee of three to confer with a subcommittee of the committee on chemistry and to report to this body what should determine a standard for butter, the report to be rendered before the final adjournment of the Association if possible."

Messrs. Alvord, Whitcher, and Henry were appointed. Through the action of several members of the chemical committee, Messrs. Scovell, Jordan, and Myers were appointed to act for the chemical committee, with the subcommittee of the agricultural committee.

Mr. Morrow suggested that samples of butter for analysis might be obtained from the dairy exhibit at Chicago. On motion of Mr. C. W. Dabney, jr., a committee, with Mr. Morrow as chairman, was appointed to get samples of premium butter from the Chicago Dairy and Fat Stock Show, and to send them to three or more experiment station laboratories for analysis. Messrs. Dabney, Armsby, and Myers were appointed a committee to designate laboratories to which the samples of butter should be sent.

Mr. Gulley spoke of the effect of feeding cotton seed in various forms to milch cows, and offered to furnish stations with samples of butter from cows so fed. Mr. Alvord said that in any dairy test a record should be kept of the effect of feed, of time when animals were weighed, of amount of water drunk, etc. He had noted three different methods of weighing. Mr. Cooke said that he fed twice daily at 9 a. m. and 4 p. m.; that the feeding period was three weeks; that each animal was weighed on three consecutive days at the beginning of each period; and that the average of the weights was taken as the weight for the period. Mr. Porter said he weighed at 11 a. m., and adopted seven-day periods for preparation. Mr. Armsby stated that he weighed every day before watering. Mr. Davenport asked how many fed twice a day, how many three times, etc. Nine fed twice, five three times, and none more than three times; eight watered once, four twice, and none more.

Mr. Morrow dwelt with much emphasis upon the desirability of some stations engaging in the work of testing breeds. He suggested that a beginning be made on small animals; for example, on sheep, comparing the production of mutton and of wool. Mr. Cooke asked "shall we test dairy breeds on the experiment station farms or on the farms of the owners?"

At this point the laboratory committee reported the laboratories of the following institutions, as selected to analyze butter samples: The United States Department of Agriculture, the Connecticut Experiment Station, the Agricultural Experiment

Station of the University of Wisconsin, the Kentucky Agricultural Experiment Station, and the Agricultural Experiment Station of the University of Illinois. It recommended that water, fat, salt, curd and as much more as possible be determined. The report was adopted.

In continuation of the question of testing breeds, it seemed to be the opinion that animals should be tested at the stations in order to insure fairness and accuracy. Mr. Alvord believed that stations would do better to test few breeds and many animals, rather than few animals and many breeds. Mr. Morrow agreed with him. Mr. Henry stated that if ten stations had each two animals of one breed, the twenty animals would give a valuable average; that in Denmark, experiments are made in private dairies and that we might do the same.

Mr. Cooke thought the farmer whose time and money are put into a breed might, on his farm, get a better expression of their capacity than could be got if they were brought to the station. Mr. Roberts thought that tests made thus would be worth nothing; no animal should be under the control of an interested party. Mr. Henry thought Mr. Cooke's idea could be carried out if station officials saw that the milk got to the laboratory all right. Mr. Thorne said he had given the subject much thought and had made some experiments, but that the more he thought of the matter the more he was perplexed.

The following persons were among those present at the meeting: Messrs. Alvord, Armsby, Atwater, Balentine, Bishop, Clute, Dabney, Davenport, Fairchild, Gulley, Harris, Hayward, Henry, Hickman, Hicks, Jordan, McInnis, Morrow, Nourse, Phelps, Plumb, Porter, Redding, Roberts, Scott, Speer, Thorne, Whitcher, and Whitney.

The committee met at 10.40 a. m. Friday, November 15.

Mr. Alvord reported that the committee to determine a butter standard had met and decided that, as great care was necessary, each member should work for a few months to secure data upon which to base his judgment.

Mr. Alvord then discussed "plat experiments."

Mr. Henry asked to have grasses discussed, as he thought there would be much difference of opinion. Mr. Scovell stated that *festuca pratensis* did very well in Kentucky. Mr. Plumb commented upon results with grasses in Tennessee. Mr. Voorhees reported that he had tried alfalfa in New Jersey with good results. Mr. Porter said it stood drought and made a fine growth in Minnesota, but did not endure the winter. Mr. Plumb stated that in New York, at the Geneva Station, he had grown alfalfa on heavy clay-loam soil for several years in experimental plats with excellent results, and that it never winter-killed; in Tennessee he had not succeeded in getting a good crop, as the young plants, late in the season, were smothered by weeds. It was asked whether the plant thrived on lime soil. Mr. Scovell said he could not grow it successfully in Kentucky as it became diseased after attaining a height of 6 or 8 inches, and wanted to know whether the disease affected the crop generally. Mr. Voorhees said it was a lime plant. The testimony of those present was that it did not suffer as a rule from disease. Mr. Atwater stated that the Department of Agriculture was anxious to help in introducing new grasses and would send seeds to the stations for testing if desired. He commended the work of Dr. Jenkins of the Connecticut Station, and referred to the work of the Storrs School Station in investigating the growth of grasses and forage plants and their capacity for absorbing nitrogen from the air. Mr. Henry asked, "How many have grown alfalfa on experimental plats?" Answer, twelve. "How many have grown alfalfa on fields of one-half acre or more?" Answer, seven. Six stated that they had grown good crops on plats. Mr. Henry said that alfalfa would not fight its way among weeds; that he had seen in California an alfalfa tap-root about an inch in diameter a short distance below the crown, and fully twenty feet in length; that the enormous tap-root enables it to

thrive in dry soils; but that, however, it must have clean land the first year. Mr. Scovell stated that he could get a perfect stand, but no yield.

Senator Reagan, of Texas, was introduced. He stated that for alfalfa the land must be very clean; a hoed crop grown upon it the first season, manured in the fall, and the alfalfa sown in drill in the spring. Mr. Porter approved this method. Mr. Morrow described grass tests which he saw in Reading, England, on the farm of Messrs Sutton & Sons, the largest grass-test farm in the world. He spoke of the uncertain character of blue grass seed, shown by examinations made at the Illinois Station, and stated that in future that station would not sow any blue grass in Illinois without testing it. Mr. Scovell offered to send the stations samples of blue grass from Kentucky. Mr. Voorhees asked whether seedsmen guaranteed their grass seed. He believed they should be required to guarantee them. Mr. Hicks believed that impracticable.

Orchard grass was discussed. It was brought out that ten had grown orchard grass in the field, seven had found it valuable and one useless as hay, seven valuable and one useless as pasture. Mr. Roberts said that the roots of orchard grass were almost indestructible, especially when grown with clover. Mr. Porter had been familiar with orchard grass for thirty years and thought it valuable for hay if cut in the proper stage of growth. For pasture, he said alsike gave the best results in Minnesota, and that he thought it the most valuable pasture grass in the United States. Five persons stated that they grew orchard grass with clover.

At the request of Professor Morrow the station representatives made out lists of the best four meadow and best four pasture grasses for their respective States. The following is the result:

State.	Pasture grass.	Meadow grass.
Illinois	Blue grass, Timothy, Orchard grass, Red-top.	Timothy, Orchard grass, Red-top, Meadow Fescue.
Indiana	Orchard grass, Fox-tail, Blue grass, Red-top.	Orchard grass, Blue grass, Timothy, Meadow Fescue.
Kentucky	Kentucky blue grass, Orchard grass, Festuca Pratensis, Timothy.	Timothy, Orchard grass, Red-top, Festuca Pratensis.
Maryland	Kentucky blue grass, Orchard grass, Red-top, Fescues.	Tall Fescue, Red-top, Timothy, Orchard grass.
Mississippi	Bermuda grass	Bermuda grass, Johnson grass, Crab grass.
Missouri	Orchard grass, Kentucky blue grass, Alsike clover, Timothy.	Timothy, Rhode Island bent, Orchard grass.
New Jersey	River-meadow grass, Orchard grass, Timothy.	Timothy, Red-top, Orchard grass.
New York	Timothy, Orchard grass, Kentucky blue grass, Red-top.	Timothy, Orchard grass, Kentucky blue grass.
Ohio	Blue grass, Meadow Fescue, Red-top, Orchard grass.	Timothy, Timothy, Timothy, Timothy.
South Carolina		Bermuda grass, Crab grass, Johnson grass, Texas blue grass.
Tennessee	Kentucky blue grass, Red-top, Crab grass, Timothy.	Red-top, Timothy, Crab grass, Orchard grass.
Virginia	Red-top, Orchard grass, Blue grass, Timothy.	Timothy, Red-top, Orchard grass, Blue grass.
Wisconsin	Blue grass, Timothy, Orchard, Red-top.	Timothy, Orchard, Meadow Fescue, Red-top.

The chairman put the question, "Is it best for stations to confine tests to a limited number of grasses?" Mr. Hicks said that in the west it was necessary to test many wild grasses. Mr. Stockbridge thought that in the older States little was known about grasses, and said that the Indiana Station in working on grasses had found twenty-eight wild grasses unknown until quite recently.

Mr. Roberts suggested that the committee discuss corn. On being questioned by him, nine delegates stated that they grew one-half acre or more of corn for forage, three of whom grew corn for the silo, but for the grain first, picking the ears and putting the forage in the silo. Mr. Armsby wished to know how many grew ensilage corn in one field and grain corn in another. Mr. Roberts said he had but one corn

crop, and when pasturage was scarce made use of the corn. Mr. Stockbridge approved this plan. Mr. Voorhees said the object should be to get the most available food from the smallest area. Mr. Armsby said he wished to know how to get the most digestible food per acre. By questions, it was found that one person had grown 20 or more tons of green corn per acre; five, 15, or more. Mr. Porter had grown as high as 35. Mr. Roberts said that from analyses collected from many bulletins, noticing the water and woody matter, he had found that sometimes smaller yields had absolutely more feeding matter than larger ones. Mr. Armsby asked whether digestion experiments were not necessary in order to get at the feeding value of forage crops. The importance of the work of the chemist was dwelt upon. Mr. Henry said he had worked in ensilage since 1881, spending as high as \$5,000 a year on silos, had had as many as seven in working order at a time and had always struck his snags in the chemical analyses. He thought a record should be kept to see whether there is not a loss during the curing of forage, and spoke of the value of a dry house for handling fodder. He recommended a sausage cutter for grinding fodder. Mr. Roberts used an ordinary grinder. Mr. Henry said he had found in some corn-stalks when ground a fine powder, very sweet and very palatable, almost good enough for pudding.

APPENDIX C.

REMARKS OF HON. EDWIN WILLITS, ASSISTANT SECRETARY OF AGRICULTURE, IN CONFERENCE OF EXPERIMENT STATION DIRECTORS, WEDNESDAY AFTERNOON, NOVEMBER 13, ON RESOLUTIONS PROVIDING FOR CO-OPERATION BETWEEN U. S. DEPARTMENT OF AGRICULTURE AND THE AGRICULTURAL EXPERIMENT STATIONS, IN RAISING AND TESTING FIBER PLANTS.

As I am referred to in the report, I will make a few remarks in reference to the views of the Department. As the basis for a short statement of facts, let me read what the Secretary of Agriculture says of this subject, on page 19 of his first report :

"I have given much thought, since assuming my duties, to the subject of fibers, a subject whose importance can not be overestimated, and I have found a wide-spread interest in the matter of a promotion of the cultivation and manufacture of flax, jute, and ramie, and other textile fibers. The correspondence of the Department on this subject has become very large. In the States of Indiana, Illinois, and all the northwest, large amounts of flax are raised for the seed alone. The question now is, can not the fiber be utilized also? While the cultivation of jute and ramie can hardly be classed as yet beyond the experimental stage, enough has been grown to justify the belief that in most of the Southern States they can be produced in abundance and of good quality.

"The question, therefore, is not so much whether this country can produce all these fibers as whether the farmer can find a market for those he may produce. The manual labor heretofore necessary in the separation of the fiber from the stalk has, in competition with the cheaper labor of other countries, rendered it impossible for the fiber industry here to maintain an economic standing, and our only hope lies in the invention of decorticating machines that shall take the dry stalk or the green one, as the case may be, and produce in one, or at most two operations, the fibers in a short time with a minimum of cost and without the primitive manual labor incident to the rotting, breaking, hatcheling, pounding, etc.

"Within the last five years, the mechanical genius of both continents has been directed to the invention of machinery to accomplish these results. It is claimed emphatically that there are one or more such for the rendering of flax. Several machines and processes for the rendering of the ramie fiber, which is far more difficult than that of flax, are claiming public consideration, but the tests of their efficiency at this date, as reported to this Department, have not fully demonstrated their economic success. Still there has been such substantial progress made in the last five years that we seem to be approaching the solution of the problem.

"Seeing the importance of this subject, I have taken advantage of the presence, at the Paris Exposition, of a gentleman versed in this subject, and have commissioned him to investigate all the fiber machines on exhibition there, to visit all the flax and hemp growing countries of Europe, to examine the flax machines in operation, and the ramie machines wherever tested, and to report fully thereon. I am seeking for information from every quarter likely to give it, and to do all that can be done to promote an industry that will, if successful, save to this country \$20,000,000 annually

and which may take the place of raising of wheat and other cereals in States where their production is not now profitable. I shall ask from Congress an appropriation to enable me to prosecute a more extended investigation of this subject."

There are a few points on which I desire to make a few remarks. The Secretary has said in substance, that although the cultivation of textile fibers is not yet beyond the experimental state, we still have an assurance that in some parts of the country, they can be raised with profit. I know through the correspondence coming to me that the claim is made in almost every part of the country that any one of these fibers can be raised with profit. It is not so, and I wish to say that with reference to flax, I am conservative. There is an idea that flax will grow anywhere and especially in the Northern States, and that large areas are now being cultivated is regarded as a demonstration. It is true that flax will grow anywhere north of a certain latitude, but it does not follow that the best quality of flax will grow, and I fear that when tested, the flax grown on the prairies of Illinois, the plains of Dakota, Nebraska, etc., will not be found to produce a fiber of first quality. It will produce a fiber that can be used; but we must remember that the countries that produce the best flax are those that have long seasons and a climate more or less humid—like Belgium and Ireland. Those countries raise flax with a long stem having an even fiber. It goes without saying that their climate will produce a fiber better than any that can be raised in Illinois, where the season is short, sharp, and quick, bringing the flax to maturity in a short time. The same thing is true farther west and north. But there are parts of this country satisfying the conditions; for instance, in the western part of Oregon and in the northwest part of California, there is a rain-fall that is probably sufficient. One of the experiments remaining will be to determine these localities.

Now here is where we desire co-operation with you. Next year we hope to be able to get the best quality of seeds of all kinds to distribute in bulk to the stations, and we wish you to test the quality of the fiber produced, the amount produced, and report to us.

Ramie grows in Pennsylvania and New York, and it will be demonstrated, I have no doubt, that it can be economically grown there, but it needs a southern climate. We want you to test it.

We also wish your co-operation in another direction. The Secretary spoke about machines. There are machines and machines, processes and processes. Almost every mail is loaded down with communications from persons claiming that they have machines that are successful; but, alas, they do not prove to be so. We are now making arrangements to test these machines. It is the purpose of the Department, when we get ready, to issue notice to all machine makers and inventors to bring their machines and test them under the auspices of the Department. Then we shall want to draw on you, gentlemen, for the material for the test: the flax, the ramie, the jute, the hemp, etc.

Most of the testing will be done with the material in a dry state, but much will have to be done when the crops are growing, and before they will be at their best. A ramie machine was tested in Pennsylvania on the 10th day of October, 1889, with material both dry and green, and it seemed to me that it would, in the long run, be more economical to work the green material than the dry, because of the difficulty of drying in this climate the immense product on an acre or 100 acres. In California or in the far west, where there is no rainfall, the dry material would of course be used.

The importations last year of these fibers did not amount to far from \$40,000,000, but I do not need to say anything to you about the importance of this matter.

APPENDIX D.

ASSOCIATION OF AMERICAN AGRICULTURAL COLLEGES AND EXPERIMENT STATIONS

Circular.]

OFFICE OF THE EXECUTIVE COMMITTEE,
Agricultural College, Md., May 22, 1890.

The report of the special committee of the Association on the subject of the relations of the War Department to the colleges is transmitted herewith, accompanied by the papers referred to in the report.

The concluding recommendation of the special committee has the hearty approval of the executive committee.

The proper officers of every institution concerned are urgently requested to at once address a letter to the Secretary of War, expressing cordial assent to the system of regulation and administration of military affairs at the colleges, as formulated in the papers issued from the War Department.

For the Executive Committee.

HENRY E. ALVORD,
Chairman.

STATE COLLEGE, PA., May 15, 1890.

*To the Executive Committee of the Association of
American Agricultural Colleges and Experiment Stations.*

GENTLEMEN: The undersigned, a committee appointed at the recent meeting of the Association, to confer with the War Department in regard to military instruction at the colleges, established under the act of July 2, 1862, were instructed to complete their work after the adjournment of the Association, and to forward their report when prepared to the executive committee thereof. In accordance with that direction we have now to report as follows:

It will be recalled, of course, that the subject came before the War Department on the one hand, and before the Association in its representative character on the other hand, with reference to the proper interpretation and application of the provision of the law of 1862, which requires that military instruction shall be given in the institutions receiving the benefits of that act. By subsequent legislation, as is well known, the War Department has been authorized to detail a sufficient number of officers to direct military instruction at such colleges, and to furnish a suitable supply of arms and ammunition. It was not unnatural, therefore, that the War Department, after an experience of more than twenty years in this direction, should feel that the time had come when it might be for the mutual interest of the Department and of the institutions to have the military organization at the colleges placed under a more definite and systematic foundation, in order to secure the better fulfillment of the purpose contemplated by the law.

In accordance with this view the Department had, in the summer of 1889, appointed a number of officers charged with the duty of reviewing the whole subject, and making such recommendations to the Secretary of War as should seem to them advisable.

The Board had met accordingly, and submitted its findings to the Department. It was at this point that the representatives of the colleges intervened, placed themselves in communication with the War Department, brought the subject to the attention of the Association, and advised the appointment of a committee to consider the whole subject.

The committee thus appointed devoted a large amount of time to the subject before the convention adjourned. The Secretary of War and the Adjutant General manifested from the first the most sincere desire to meet the views and wishes of the colleges as far as was consistent with the interests of the service, and seemed never for a moment to feel that there was the slightest conflict between the real interests of the Department and of the colleges respecting this subject; so that the only question involved was one of detail as to the arrangements that could be wisely adopted and smoothly administered. The Department placed at the disposal of your committee the findings of the Board and all other documents necessary to inform it fully of the views and wishes of the Department, and the intercourse between the committee and the officials of the Department was throughout of the most harmonious and satisfactory character. The committee felt obliged to object, in the most unqualified manner, to everything which looked toward the intervention of the Department, directly or indirectly, in the internal management of the institutions. There was no difference of opinion among the members on that point. At the same time, the committee fully recognized the fact that, in order to make the military instruction uniform and effective, it was as essential that the colleges concerned should do their part in good faith as that the Department should do its part.

It seems unnecessary for the purpose of this report to give a detailed account of the various interviews held between the committee and the officials of the Department, or the successive steps which led to the final result. It is sufficient to say that this result when reached represented the unanimous and full judgment of the committee, and was accepted by the Department without qualification or reservation. It was agreed that the methods embodied in the statement finally agreed upon by the two parties should take the form, *first*, of an order to be issued to all officers now or hereafter detailed as professors of military science and tactics at the colleges; and, *second*, of a series of recommendations and suggestions to the institutions concerned. This has been done, and it is believed that the result can not but be highly beneficial.

A copy of the two documents (being respectively General Orders No. 15, dated at the Adjutant General's Office, February 12, 1890, and Circular B, dated at the Adjutant General's Office, February 13, 1890) is herewith submitted.

In conclusion, it is proper to say that the delay in submitting this report was occasioned, in the first instance, by the impossibility of completing the subject, owing to the various engagements of the different members of the committee, and the difficulty of making trips to Washington for consultation; and, later, by the necessary absence from home of the chairman of the committee, who was charged with the duty of formulating the report and transmitting it to the executive committee. The committee desires also to recommend that all the institutions concerned be furnished with copies of the two documents above referred to, and that they be urgently requested by the executive committee of the Association to signify to the War Department their formal and cordial assent to the system of regulation and administration as therein formulated.

Respectfully submitted,

GEO. W. ATHERTON, of Pennsylvania, *Chairman*.
E. M. TURNER, of West Virginia,
H. E. ALVORD, of Maryland,
GEO. T. FAIRCHILD, of Kansas,
LOUIS L. MCINNIS, of Texas,

Special Committee.

HEADQUARTERS OF THE ARMY, ADJUTANT GENERAL'S OFFICE,

Washington, February 12, 1890.

By direction of the Secretary of War the following instructions are published for the information and guidance of all concerned :

Under section 1225 of the Revised Statutes (as amended by the act of September 26, 1888) the following rules are prescribed by the President for the government of officers of the Army detailed as professors of military science and tactics :

1.—Detail and duties of officers.

As a rule, captains of companies, regimental staff officers, or officers who have served less than three years with their regiments, or who have recently completed a tour of detached service, will not be eligible; and no details will be made that will leave a battery, troop, or company without two officers for duty with it. Whenever practicable, preference for such detail will be given to officers who have been graduated from either the artillery school, the infantry and cavalry school, or the engineer school.

The period of the detail will be three years. The professor of military science and tactics shall reside at or near the institution to which assigned, and when in the performance of his military duties shall appear in proper uniform. Officers so detailed shall, in their relations to the institutions, observe the general usages and regulations therein established affecting the duties and obligations of other members of the faculty. For the benefit of the officer and the military service, he may perform other duties at the college in addition to those pertaining to military science and tactics, and may receive such compensation therefor as may be agreed upon.

2.—Organization and discipline.

1. All rules and orders relating to the organization and government of the military students; the appointment, promotion, and change of officers; and all other orders affecting the military department, except those relating to routine duty, shall be made and promulgated by the professor of military science and tactics after being approved by the president or other administrative officer of the institution.

2. It is the duty of the professor of military science and tactics to enforce proper military discipline at all times when students are under military instruction, and in case of serious breaches of discipline, or misconduct, to report the same to the proper authorities of the institution, according to its established methods. Upon occasions of military ceremony, in the execution of drills, guard duty, and when students are receiving any other practical military instruction, he shall see that they appear in the uniform prescribed by the institution.

3.—Course of instruction.

1. The course of instruction shall be both practical and theoretical, and shall be so arranged as to occupy at least one hour per week for theoretical instruction, and at least two hours per week for practical instruction.

2. The practical course in infantry shall embrace small-arm target practice and, as far as possible, all the movements prescribed by the drill regulations of the U. S. Army applicable to a battalion. Instructions in artillery shall embrace, as far as practicable, such portions of the United States drill regulations as pertain to the formation of detachments, manual of the piece, mechanical maneuvers, aiming drill, saber exercise, and target practice. Instruction should also include the duty of sentinels and, where practicable, castrametation. Such instruction shall be given by the professor of military science and tactics personally, or under his immediate supervision.

3. Theoretical instruction shall be by recitations and lectures personally conducted and given by the professor of military science and tactics, and shall include, as far as practicable, a systematic and progressive course in the following subjects: The drill regulations of the U. S. Army, the preparation of the usual reports and returns pertaining to a company, the organization and administration of the U. S. Army, and the elementary principles governing in the art of war.

4.—*Reports.*

He shall render a quarterly report to the Adjutant-General of the Army of the whole number of undergraduate students in the institution capable of performing military duty, the number required by the institution to be enrolled as military students, the average attendance at drills, the number absent, the number and kind of drills, recitations, and lectures, or other instruction had during the quarter, and the number reported for discipline. Copies of all reports and correspondence will be retained by the professor of military science and tactics and transferred by him to the officer who may succeed him, or forwarded to the Adjutant-General's Office should the detail expire. On the graduation of every class he shall report to the Adjutant-General of the Army the names of such students as have shown special aptitude for military service, and furnish a copy thereof to the adjutant-general of the State for his information. The names of the three most distinguished students in military science and tactics at each college shall, when graduated, be inserted on the U. S. Army Register and published in general orders.

5.—*Inspections.*

The military department shall be subject to inspection under the authority of the President of the United States; such inspections to be made, when practicable, near the close of the college year. The inspecting officer shall, upon his arrival at the institution, report to the president or other administrative officer, in order to obtain from him the necessary facilities for the performance of his duty. A copy of the report of inspection will be furnished the president of the institution by the War Department.

A copy of this order will be furnished to officers now on duty as professors of military science and tactics and to those hereafter detailed, for their guidance; and also to institutions now having or hereafter applying for the detail of such officers.

By command of Major-General Schofield:

J. C. KELTON,
Adjutant General.

[Circular B.1

WAR DEPARTMENT, ADJUTANT GENERAL'S OFFICE,
Washington, February 13, 1890.

The War Department, with a view to promoting the efficiency of military instruction in the colleges and other institutions entitled to the detail of Army officers under the acts of Congress providing for such detail, recently convened a board of Army officers at Columbus Barracks to consider this subject. In reviewing the report and recommendations of this board, the Department has been in consultation with a special committee of college presidents appointed at a meeting of the Association of American Agricultural Colleges and Experiment Stations, held in Washington in November, 1889. After a full and free interchange of views concerning the matters involved, the Department has prepared and issued an order for the guidance of the officers detailed under the acts aforesaid in the discharge of their duties at these institutions.

In order that these officers may more effectively perform their duties, and in order to secure fuller co-operation between the War Department and the institutions concerned, the following suggestions are respectfully submitted:

I. The professor of military science and tactics should be a member of the faculty of the institution, with all the rights, privileges, and authority of other heads of departments or professors, and should be provided with quarters on the same terms as other professors.

II. All undergraduate students capable of performing military duty should be required to attend the prescribed military exercises. A suitable uniform should be prescribed by the institutions, to be worn by the students when in the discharge of any military duty.

III. All appointments, promotions, and changes of officers and non-commissioned officers should be made, as a rule, upon the recommendation of the professor of military science and tactics.

IV. Provision should be made by the authorities for both theoretical and practical instruction in military science and tactics, and not less than three hours per week should be allowed for this instruction, to be apportioned as the professor of military science and tactics may determine. Such provision as is possible should be made for conducting practical military instruction under cover in inclement weather. The theoretical instruction should include the drill regulations of the United States Army, the preparation of the usual reports and returns pertaining to a company, lectures or recitations on the organization and administration of the United States Army, and upon the history and elementary principles governing the art of war. Details indicating the outlines of a systematic course of theoretical instruction should be hereafter issued by the War Department, as a supplement to these suggestions, with a view of securing uniformity and continuity in the course of military instruction at the several institutions concerned.

V. Inspecting officers will, in all cases, be directed to report to the head of the institution on arrival, but, their time being limited, it is desirable that the college authorities will, as far as possible, expedite their work, bearing in mind that the officers are required to perform this duty in connection with other regular military duties. The Department, on the other hand, will instruct the inspecting officers to remain at the institution, when possible, long enough to familiarize themselves not only with the details of the military department, but also with its general standing in relation to the institution as a whole.

When these suggestions and recommendations meet the approval of the institutions affected by them, a notification to that effect, forwarded to the Department, will facilitate the establishment of the desired relations between the Government and the colleges.

By order of the Secretary of War :

J. C. KELTON,
Adjutant-General.

APPENDIX E.

EXTENSION OF TESTS APPLIED TO WHEAT VARIETIES.

[By Prof. William Frear, Vice-Director Pennsylvania Agricultural Experiment Station.]

The following suggestions, concerning the points to which it is desirable to extend the experiment station tests of wheat varieties, are here presented at the request of Hon. Edwin Willitts, Assistant Secretary of Agriculture:

In variety tests hitherto reported, the principal observations have generally been confined to the characters affecting bushel yield, including such characters as climatic hardiness, resistance against attacks of insect and fungous enemies, extent of tillering, character of straw, firmness of ear, and earliness of maturity; and rarely have exact observations been made to determine at the same time the milling, baking, and nutritive qualities of the grain; I say exact, because the general grading of grain according to weight, plumpness, color, luster, and consistency, while giving fairly comparable results when applied by a single expert, is found to yield very variable classifications when applied by several experts independently. So that the most experienced trade experts in grain grading prefer, in cases of importance, to secure the more exact testimony of the miller, the baker, and the chemist. In cases where it is impracticable to grow a crop sufficient to allow the miller enough material for the production of a flour normal in color, etc., and to determine the exact proportion of the several milling products yielded, the results of chemical analysis furnish quite accurate criteria for the estimation of the value of the grain (bran increasing with fiber, and the milling, baking, and nutritive values increasing in general with the albuminoids); a determination of crude gluten also affords the means of judging of the elasticity or "strength" of the dough, a very important factor in deciding its baking value; while the percentage of moisture determines the yield of bread from a given weight of flour.

There are certain theorists who, relying upon the general invariability of seed as compared with other portions of the plant, and upon the fixity of character resulting from long cultivation, argue therefrom the improbability of important fluctuations in the qualities of the general crops of cereals when grown within climatic limits suited to them, and under conditions insuring opportunity for development to maturity with sufficient plant food accessible, and without injurious attack of their peculiar enemies; but, of course, admitting the possibility of development of varieties by careful selection of seed from individual plants exhibiting some especially desirable quality. On the other hand, as evidence of the existence of a considerable fluctuation occurring within a short period, may be adduced the widely extended belief among practical agriculturists of advanced standing, in the good resulting from what is technically termed a "change of seed," meaning not necessarily the introduction of a new variety, but the use of seed even of the same variety grown upon a different soil and in somewhat different climatic surroundings; this benefit being supposed to occur even when applied to the most fertile farms with favorable climatic situation, and to be at least equal, often indeed superior, to the good results obtained

by extreme care in the selection of seed from the home crop; the theory being that the region benefited is not so well adapted to the growth of a good quality of grain of the variety in question as is the locality from which seed is obtained; and that in the region best adapted to such a variety the benefit arising from a change of seed must be slight, if the fertility of the soil be maintained, or the change may even be injurious.

It is in place to adduce chemical evidence pointing toward certain general classes of variations as probable. I say probable, because in a great many cases the data are too few to permit satisfactory generalization, and in most instances the deficient history of the samples has diminished the value of the data derived from their analysis.

For brevity, attention will be confined to variations in albuminoids, which form the most important factor in determining the quality of a wheat for general use.

Richardson* states, as the result of analyses of 260 samples, that the average for the United States and Canada is 13.32 per cent. of albuminoids, and between the maximum and minimum there is a difference of over 9 per cent. This difference is increased by results shown upon later analysis.

This average is below that for the world, as compiled by Koenig, and below that for Germany, England, or Russia. The highest percentage of albuminoids found in American wheat is 18.03 per cent., the sample having been grown in Dakota;† while analyses of Russian wheat show an average of 19.48 per cent. of albuminoids, and a maximum of 24.56 per cent. The deficient quality, in respect to color, of flours from north European wheats as compared with those from United States grain is of interest in this connection, and is usually attributed to the sunnier, warmer, and drier summers of America.

Upon grouping the analyses of wheats from different regions of the United States and Canada, the same writer observed marked differences characterizing the products of these regions, the Pacific and Atlantic coast regions producing grain deficient in albuminoids; in the former case, supposably, on account of climatic conditions, in the latter because of deficient fertility. The most highly albuminous wheats were produced in the region between the Mississippi and the Rocky Mountains, and especially in the spring wheat regions of the North.

In connection with the question of the best seed supply for various parts of the country, it is of interest to recall the statements made by Professor Saunders, director of the Canadian Experiment Stations, at the last meeting of the Society for the Promotion of Agricultural Science, respecting the very superior reproductive power of seed wheat raised in this northern region as compared with that raised in other parts of Canada and the United States. Likewise may be adduced the vigorous reproductive powers of wheat and barley tailings, which contain a greater proportion of albuminoids than is found in the fully developed seed. The wide variations produced by the change of climatic condition under which varieties are grown are illustrated in the transformation of wheat from a winter to a spring variety by careful culture, the former being relatively larger grained and starchy, though in the fully developed varieties of each the grain is plump and fully matured, differing from miniature grains which are highly albuminous, it is true, but shriveled and immature.

As illustrative of the wide variations produced when crops are grown in various regions of different climate and soil, but from the same seed, there may be cited the results of a test of the Russian wheat, variety Ladoga, obtained by the Canadian stations, and published in Bulletin 4 of the Central Experimental Farm. The samples grown in various parts of the Dominion were submitted, together with a portion of the original seed, to various boards of trade for inspection and grading. After careful examination the Winnipeg Board of Trade say: "None of the eleven samples of

*Bulletin I, Chemical Division, United States Department of Agriculture, p. 31.

† Richardson, Bulletin 4, Chemical Div., United States Department of Agriculture, p. 20.

the product of the Ladoga variety bear any close resemblance to the original sample forwarded, and are, for the most part, unlike one another." This report, of course, takes into account only those more obvious characters used in grading. A chemical examination by Mr. Shutt showed 12.75 per cent. of albuminoids in the original seed, and, in the various crops grown from it, a variation of from 12.12 to 17.37 per cent., excluding a frozen sample that contained only 11.87 per cent. The difference in the number of days required for development did not seem to accompany variations in composition so intimately as did a variation in the quality of the soil; yet, doubtless, the climatic influences were very considerable. It is of interest to note that the crops grown from this Russian seed retained to some extent the inferiority of flour color observed in north European flour.

Richardson, after a careful study year after year of the products obtained by Blount in his cultivation of wheat varieties at the Colorado Agricultural College, arrives at the conclusion that any given locality has a fixed capacity—assuming that average seasonal conditions are maintained—for the maintenance of albuminoids in wheat; and that seed differing from this standard for the locality tends from year to year to approach it; for foreign wheats of high albuminoid content lost nitrogen, while American wheats, deficient in nitrogen, gained correspondingly. It is of interest to note that two varieties differing widely in botanical character, the one grown in Oregon and deficient in albuminoids, the other grown in Dakota and richly nitrogenous, grew so similar in appearance as they approached the Colorado standard in composition that it was very difficult to distinguish them, while both differed very widely in appearance from the plants furnishing the original seeds.

In a later report, Richardson calls attention to the very considerable variation due to seasonal changes; such variations would somewhat obscure the general tendency of change in composition.

Certain results that I have obtained from a study of varieties as grown in Pennsylvania may require some modification of certain of Richardson's generalization. In the fall of 1885 there were sown four varieties of wheat, obtained from various eastern sources, the seed being subjected to analysis; they varied in albuminoid content from 9.65 to 13.66 per cent., and in weight of 100 grains from 2.29 to 4.43 grams; the averages being 11.90 per cent., and 3.53 grams. The crops obtained showed 14.61 to 16.42 per cent. of albuminoids and 3.67 to 5 grams per 100 grains, the average being 15.51 per cent and 4.35 grams. In every case there was an increase in albuminoids, varying from 2.05 to 6.77 per cent., the greatest gain occurring where the original percentage had been least.

From the crops of two of the varieties seed was taken for a second crop, sown in the fall of 1886. The averages for the original seed and the two successive crops are:—

	Weight of 100 grains.	Albumi- noids.
	<i>Grams.</i>	<i>Per cent.</i>
Seed.....	3.07	13.12
First year's crop	4.38	15.86
Second year's crop	4.10	13.61

Or, in the second year, there was a marked tendency to revert toward the original albuminoid content, though only a slight change in a similar direction was noted in the case of the weight of the kernel. The winter of the first season of growth was quite unfavorable for wheat, that of the second less so; but other evidence at command shows that this tendency to reversion is hardly attributable to seasonal conditions, nor the change in soil, the latter being essentially the same in all cases, as were fertilization and culture. At the same time with the sowing of the second crops of the first mentioned varieties three other varieties were tested on the same soil for

the first time; they varied in weight per 100 grains from 3.18 to 4.17 grams, and in albuminoids from 11.99 to 14.58 per cent., averaging 3.60 grams per 100 grains and 12.90 per cent. of albuminoids.

The crops obtained from these varieties varied in weight per 100 grains from 4.13 to 4.60 grams, averaging 4.29 grams; and in albuminoids, from 14.15 to 15.92 per cent., averaging 15.29 per cent. As in the case of the first group of varieties, the first crop from the original seed shows a marked increase in the weight of kernel and in nitrogen, the greatest gain in the latter constituent occurring likewise in that variety originally most deficient in this element. Thus the first crop from both groups of varieties tended to increase in weight and nitrogenous content, while the second crop of the first group, growing side by side with the first crop of the second group, showed instead a slight decrease in the weight of kernel and a very marked decrease in nitrogen. (Report Pennsylvania State College Agricultural Experiment Station, 1887, pages 104 to 109.)

Another fact shown by these analyses is of interest. Richardson's average of 32 Pennsylvania samples, drawn very largely from the eastern experimental farm crops for 1879, shows a weight of 3.37 grams per 100 grains and 12.75 per cent. of albuminoids; but all the averages of the above varieties grown at the experiment station, in a more elevated, central portion of the State are considerably higher. From Richardson's results no marked improvement would have been anticipated in the case of selected seed brought from the best wheat localities in different parts of the Atlantic regions.

Finally, a few instances of variation in composition, with variation in soil, may be called to mind:

Richardson gives results showing increase of nitrogen in a crop grown on a fallow as compared with that sown after corn.

Lawes and Gilbert gave averages for the crops of ten years, which show a considerable gain in nitrogen where complete fertilizers were used, but a maximum where ammoniacal manures were applied alone. At the same time, when the crops were grown continuously on the same soil, there was a decrease in albuminoid content notwithstanding liberal applications of fertilizers.

Jordan gave results showing a decrease in albuminoids where mineral fertilizers were used alone, but a marked increase where complete fertilizers were applied. (Brewer, Tenth Census, Vol. X, page 448; Cf. Richardson, Bulletin 9, Chem. Div., U. S. Dept. of Agric., page 21; Bulletin No. 1, Pa. State College.)

Brewer says that New York millers have observed a very considerable improvement in the quality of the wheats of that State as the result of the increased use of fertilizers, which generally contain nitrogen.

Tanner mentions the use of strong clay soil for the growth of seed barley, while lighter lime soil is chosen for the growth of malting barley.

From the above evidence it is clearly desirable that a chemical study of varieties be made in connection with field tests, not only to afford safer criteria for the determination of a comparative value of the varieties tested, but as well to assist in more clearly establishing the character of the variations in composition due to specific changes in the environment or other conditions of growth.

Hedce, for the exact study of a variety the following data are desirable:

1. The chemical, physical, and agricultural characters of the seed, and often the milling and baking qualities; the history of its development, including the climatic and soil conditions of the locality in which it was grown, and the specific character of the season in which the seed taken for test was produced.
 2. Similar data for the crop obtained.
 3. The continuation of such observations for two or three successive years.
- By such a method only can the exact value of any variety for any given soil or climate be determined; or, in case a change of seed be found desirable, owing to the impossibility of producing continuously a product of high quality from seed

grown in the same locality, this is the only method by which the best source of seed can be accurately determined. The additional expense of chemical analysis would be slight if the more extended tests be confined to varieties that have given evidence, either in preliminary tests or in the history of their development, of a special adaptation to the locality in which the test is made; the milling and baking tests require a larger crop, with increased expense, due to the difficulty of maintaining the purity of the seed; but very great benefits are regarded as probable from the introduction of any variety. These tests should, by all means, be included.

When a preliminary test is made with the intention of eliminating the varieties that are manifestly without adaptation to a locality, or where the synonymy of varieties is being studied, a much less extended test may answer every purpose; but for the latter object the great changes observed in the agricultural characters of a variety as the result of only a single year's growth under new conditions indicate the desirability that, as far as possible, all the varieties compared should be grown from seed recently obtained from the localities in which they were developed.

As a result of the adoption of some such method by the stations in wheat-growing States the variety tests, now so generally regarded as of extremely fugitive interest and value, would attain scientific importance and, at the same time, would possess far greater practical value.



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